

2-m FM HANDHELD TRANSCEIVER

TH-27A/E

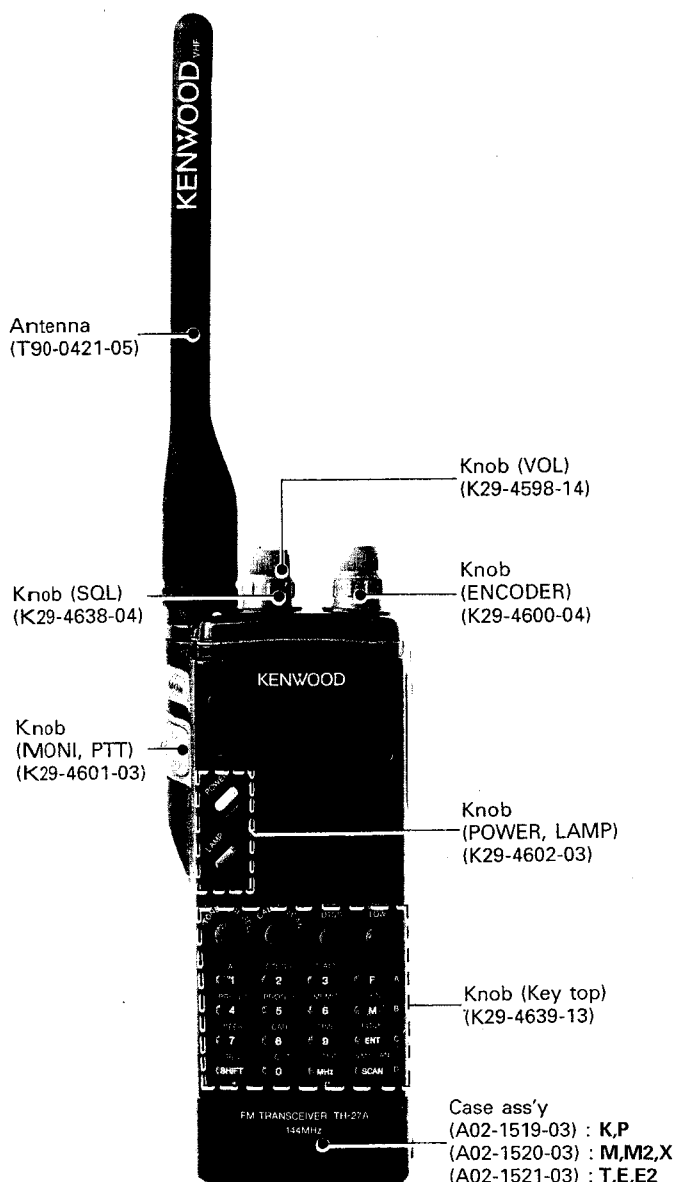
SERVICE MANUAL

KENWOOD

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B51-8074-00 (O) 1406

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TH-27A/E

CIRCUIT DESCRIPTION

Frequency Configuration

The frequency configuration is shown in Figure 1 and Table 1.

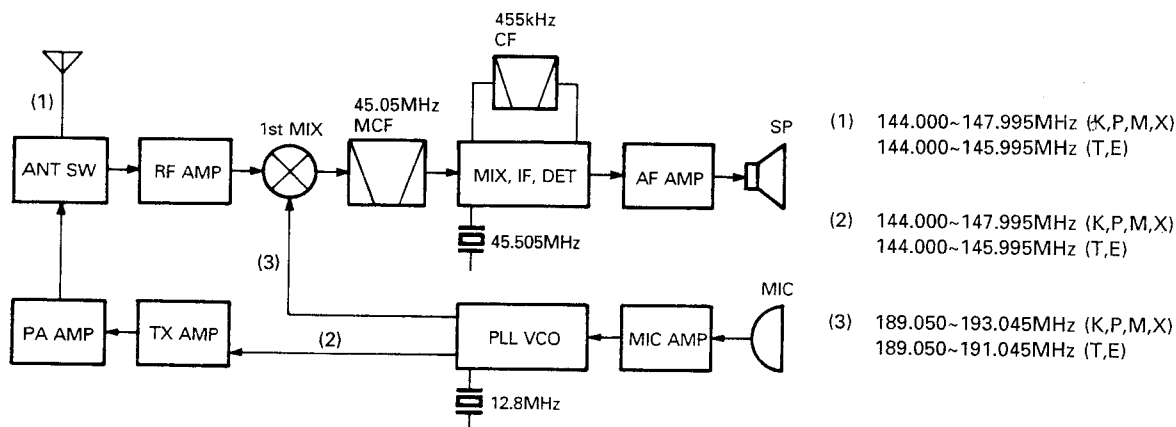


Fig. 1 Frequency configuration

Receiver System

• RF amplifier

The signal from the antenna is passed through a low-pass filter and transmission/reception selector circuit, and input to the RF amplifier.

The input signal is amplified by Q8 and sent to the bandpass filter to eliminate the unwanted frequency band.

Receiving system	Double superheterodyne system	
	1st IF frequency	45.05MHz
	2nd IF frequency	455kHz
Transmitting system	Direct oscillating amplification system	
Modulation system	Variable reactance phase modulation	

Table 1 Basic Configuration

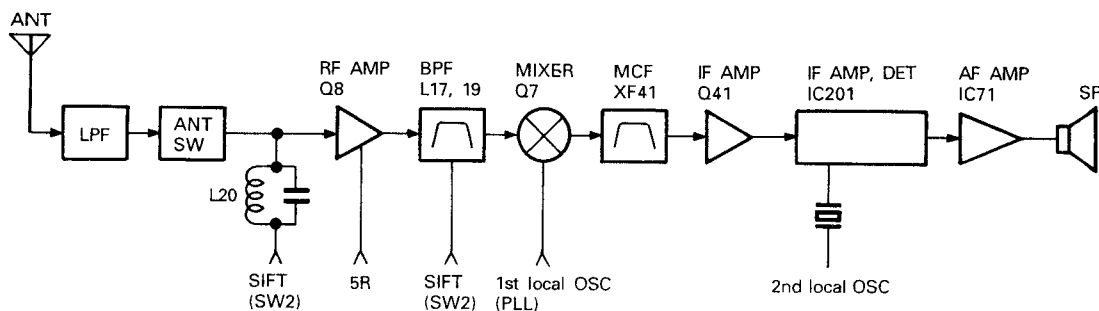


Fig. 2 Receiver section configuration

• First-stage mixer

The input signal is mixed with the first local oscillator signal from the PLL circuit by first-stage mixer Q7, and so is converted into the first IF signal. The unwanted frequency band of the first IF signal is eliminated by a two-stage monolithic crystal filter (MCF).

Item	Rating
Nominal center frequency (fo)	45.05MHz
Pass bandwidth	±7.5kHz or more at 3dB
Attenuation bandwidth	±22kHz or less at 25dB
Guaranteed attenuation	80dB or more at -910kHz Spurious : 40dB or more within ±1MHz
Ripple	1.0dB or less
Insertion loss	4.0dB or less
Terminal impedance	800Ω/2pF

Table 2 MCF (L71-0409-05) (TX-RX unit XF41)

CIRCUIT DESCRIPTION

• IF amplifier

The first IF signal is amplified by Q41 and input to IC201 (FM signal processing IC), where it is mixed with the second local oscillator signal and so is converted into the second IF signal.

The unwanted frequency band of the second IF signal is eliminated by a ceramic filter. The resulting signal is then amplified and detected.

Item	Rating
Center frequency of 6dB bandwidth (fo)	Within $455 \pm 1.5\text{kHz}$
6dB bandwidth	$\pm 7.5\text{kHz}$ or more
40dB bandwidth	$\pm 15\text{kHz}$ or less
Passband ripple	1.5dB or less (within $455 \pm 1.5\text{kHz}$)
Guaranteed attenuation	27dB or more ($\pm 100\text{kHz}$)
Insertion loss	6dB or less
Input/output impedance	1.5k Ω

**Table 3 Ceramic Filter (L72-0362-05)
(TX-RX unit CF201)**

• AF amplifier

The frequency characteristics of the FM-detected audio signal are compensated for by a deemphasis circuit consisting of R219 and C219 and an active high-pass filter circuit consisting of Q201.

The audio signal is then passed through an AF variable resistor and amplified by power amplifier IC71 to obtain the desired output.

• Squelch and mute circuits

The output of the squelch circuit consisting of IC201 and Q1 is output from the SC pin to pin 10 of the microprocessor as the BUSY signal. The microprocessor controls the MUTE 1 and MUTE 2 signals in accordance with the BUSY input signal logic and other function states, and so controls the audio signal. The microprocessor also controls the MUTE 1 and MUTE 2 signals during the bell function and CTCSS and DTSS operations, thus controlling the audio signal.

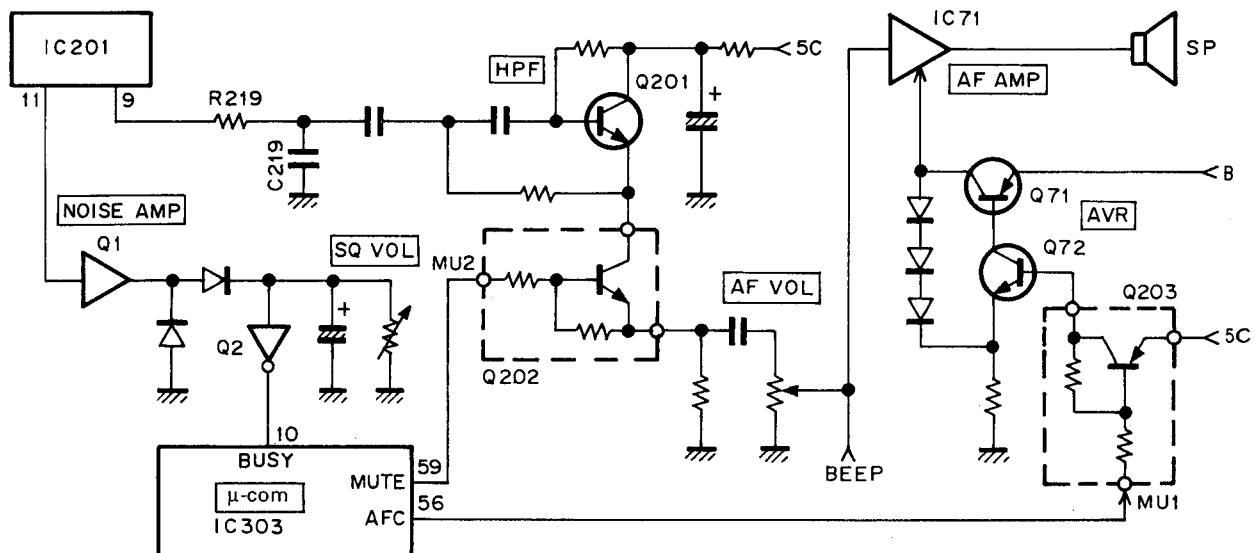


Fig. 3 AF amplifier, squelch, and mute circuits

Condition			MU1	MU2
Transmission			H	L
Reception	Normal operation	Squelch on	H	L
		Squelch off	L	H
	Bell operation	Standby	H	L
		Receive (bell operation)	L	L

MU1 : Muted when high.

MU2 : Muted when low.

Table 4 Muting conditions

CIRCUIT DESCRIPTION

• S-meter circuit

The S-meter signal is output from pin 13 of IC201 as a direct current corresponding to the input signal, converted to a voltage by R212, then input to pin 33 of the microprocessor. The DC voltage is digitized to control the LCD S-meter display.

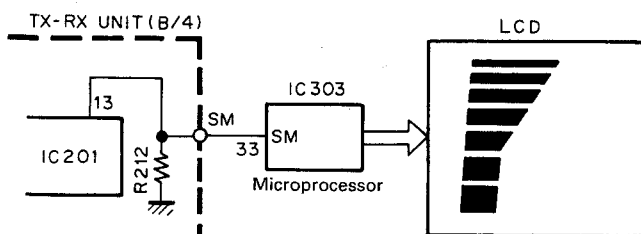


Fig. 4 S-meter circuit

Transmitter System

• Microphone amplifier

The signal from the microphone is passed through a 6dB/oct pre-emphasis circuit consisting of C246 and R244 to amplifier IC203 (1/2), then limited. Distortion components exceeding the audio band of the resulting signal are then eliminated by a splutter filter consisting of IC203 (2/2).

• Modulator circuit

The output from the microphone amplifier is passed through variable resistor VR207 for modulation adjustment to varicap diode D3 of the VCO, controlling the VCO frequency and so producing a frequency-modulated RF output.

• Drive and final circuits

The modulated RF signal from the VCO is amplified to about -5dBm by a buffer amplifier. The signal is then amplified to about 15dBm by the drive subunit. The amplified signal is input through pin diode D3 for transmission output adjustment to power module IC3. The power module consists of a two-stage amplifier and amplifies the signal to about 5W for output.

• Transmission/reception selector circuit

The transmission output is passed through the transmission/reception selector circuit and low-pass filter to the antenna.

The transmission/reception selector circuit, which consists of D4 and D5, is turned on during transmission and off during reception to switch the signal.

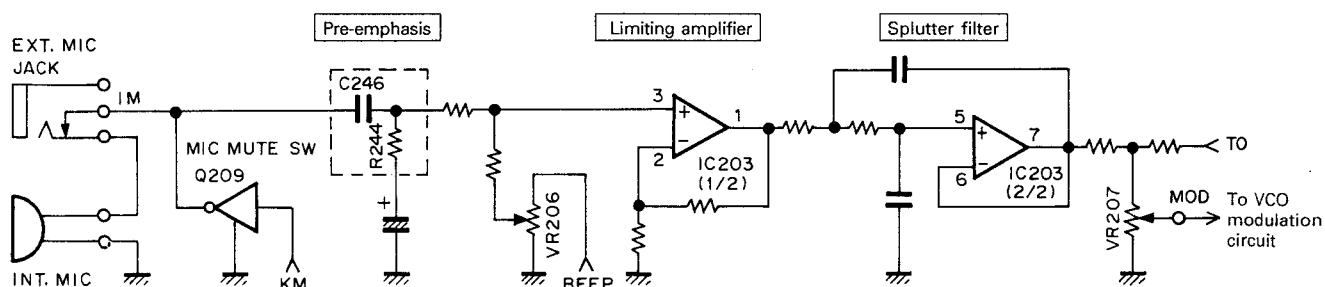


Fig. 5 Microphone amplifier

CIRCUIT DESCRIPTION

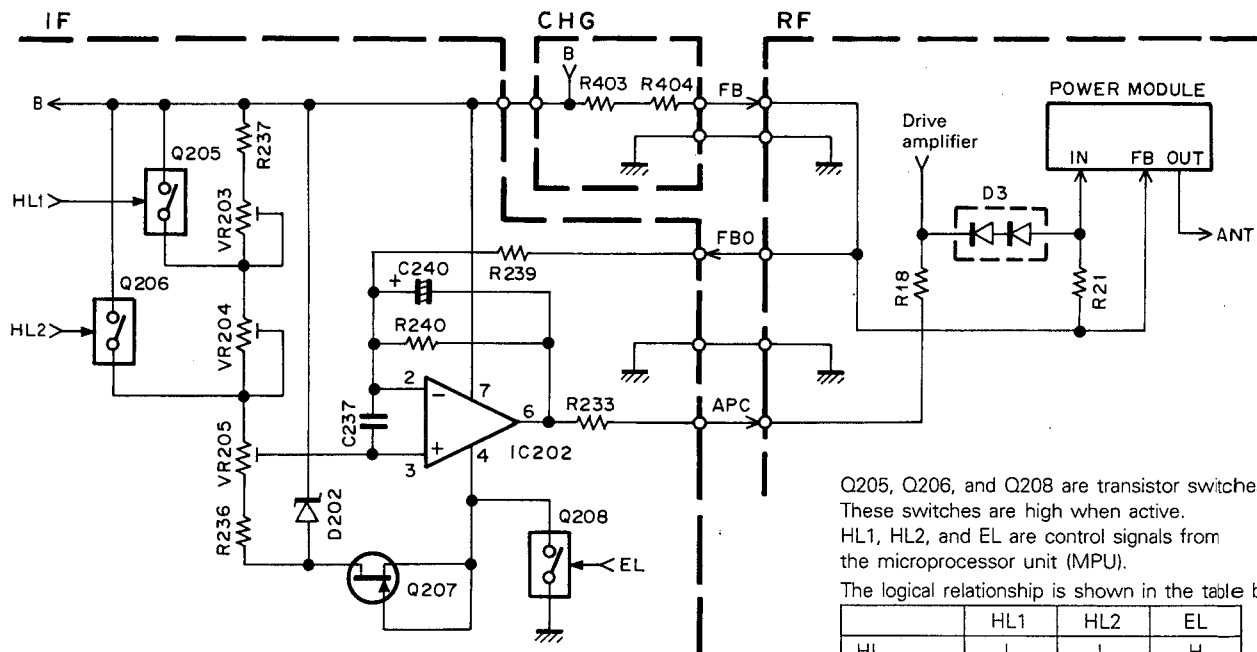
• APC and transmission output selector circuits

The automatic power control (APC) circuit is used to obtain a stable transmission current. This circuit detects the collector current in the final stage of the power module and controls the transmission output as follows :

To differential DC amplifier IC202, two voltages are applied the reference voltage produced by dividing the voltage of constant-current Zener diode D202 by variable resistors VR203 through VR205 for transmission output adjustment, and the detection voltage generated across R403 in proportion to the collector voltage in the final stage.

The APC voltage, proportional to the difference between the reference voltage and the detection voltage, is obtained at the output pin (pin 6) of IC202. This APC voltage controls the attenuation of input diode D3 of the power module and stabilizes the transmission output.

Q205 and Q206 are selected when the transmission output is selected. The reference voltage is then changed, and the transmission output is fixed at about 5W (high), 2.5W (medium), or 0.5W (low). Q208 stops the operation of the APC circuit when the transmission output is set to EL (economic low power).



Q205, Q206, and Q208 are transistor switches. These switches are high when active. HL1, HL2, and EL are control signals from the microprocessor unit (MPU). The logical relationship is shown in the table below.

	HL1	HL2	EL
HI	L	L	H
MID	H	L	H
LOW	L	H	H
E-LOW	-	-	L

Fig. 6 APC and transmission selector circuit

CIRCUIT DESCRIPTION

• Economic low-power circuit

The economic low-power circuit is used to send the drive circuit output directly to the antenna without passing through the power module. When this is done, the bias power at the base of the power module is turned off. This reduces the power consumption.

The E-LOW pin is made low when the transmission output is set to EL. The transmission circuit then operates as follows :

1. Q14 and Q15 are turned off, and the 5T of the power module is set to 0V. D4 is turned off at the same time and the power module output is opened.

2. Q13 is turned off, so D3 is turned off. Thus the drive circuit output is not supplied to the power module.
3. Q11 is turned off and Q12 is turned on, so D2 and D6 (1/2) are turned on. Q3 is also turned off and D5 is turned off. The drive circuit output is passed through D2, D6 (1/2), L14, and L9 to the antenna.

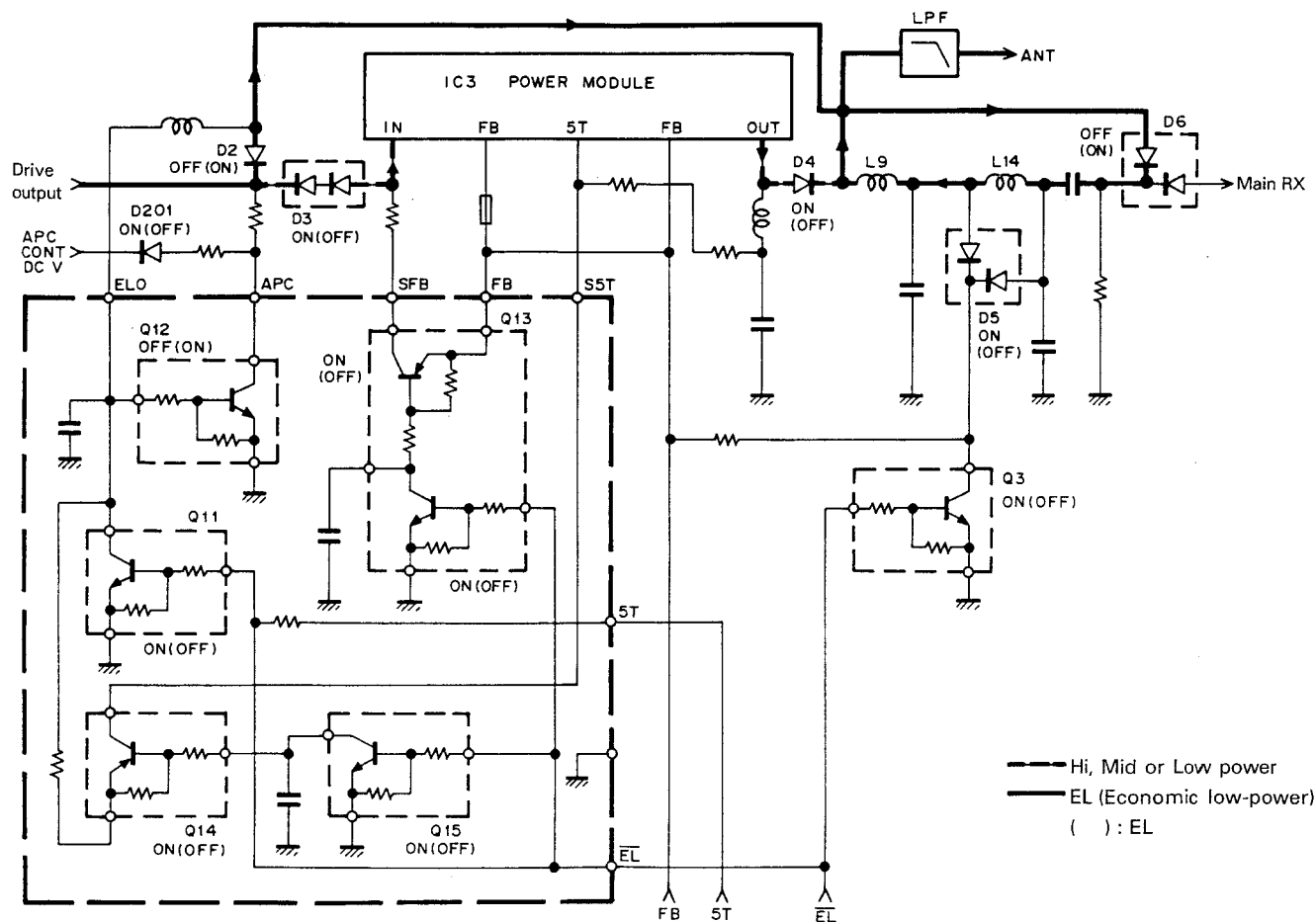


Fig. 7 Economic low-power circuit

CIRCUIT DESCRIPTION

PLL Circuit**• PLL**

A 5kHz or 6.25kHz reference frequency is obtained by dividing 12.8MHz reference oscillation frequency X1 in IC1. A comparison frequency is obtained when the VCO output is amplified by Q2 then divided in IC1 (pulse swallow system-based PLL IC).

A 5, 10, 12.5, 15, 20, or 25kHz PLL synthesizer is implemented by phase-comparing the reference frequency and comparison frequency obtained when reference oscillation frequency X1 is divided.

• VCO (X58-3740-00)

The desired frequency is produced directly by a Colpitts oscillator circuit consisting of FET Q2. The VCO control voltage is applied to varicap diodes D1 and D2 to change the oscillation frequency. The TXV pin is made high during reception. Q1 and D4 are then turned on to change over the oscillation frequency.

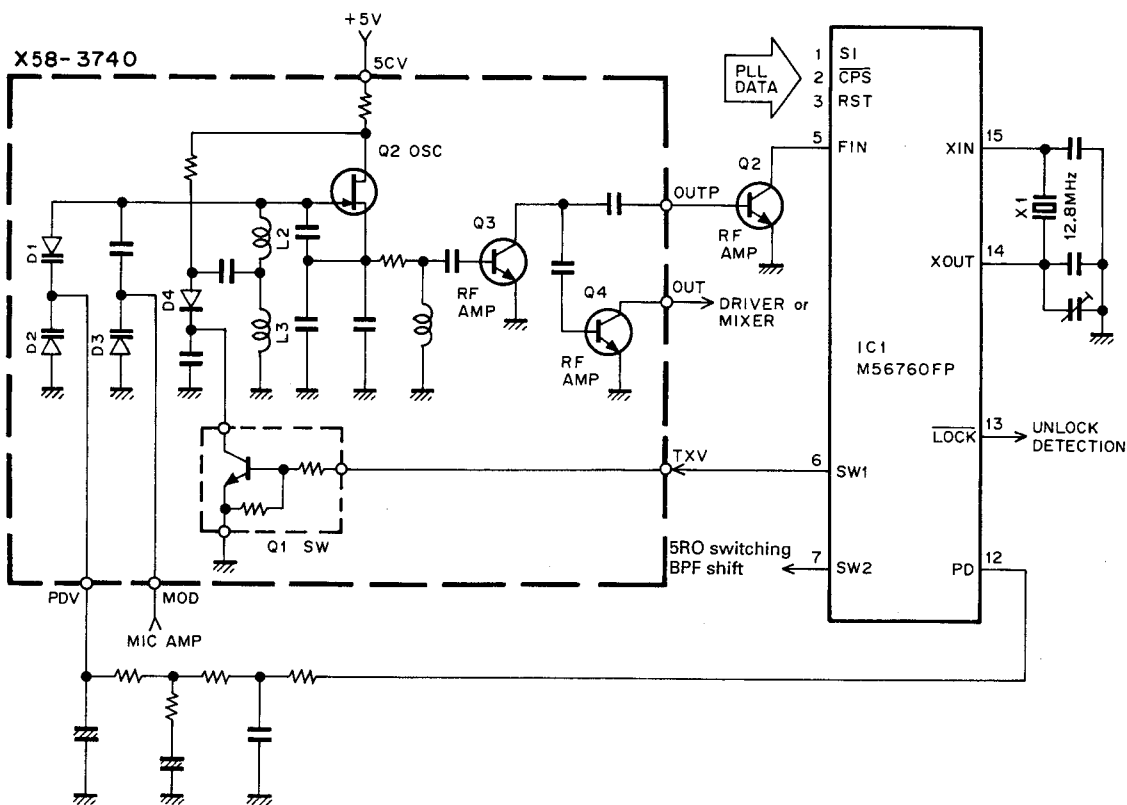


Fig. 8 PLL and VCO circuits

• Unlock detector circuit

When the PLL circuit is in the unlock state, the pulse that is output to the LOCK pin (pin 13) of IC1 is waveform shaped by R21 and C15. The UL pin is then made high. The voltage at the UL pin is monitored by the microprocessor to control the transmission or reception selection timing.

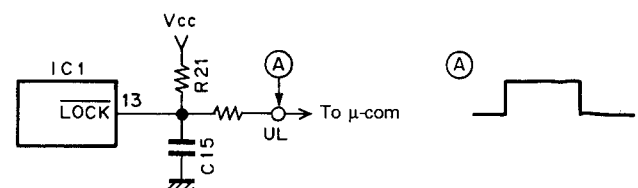


Fig. 9 Unlock detector circuit

CIRCUIT DESCRIPTION

Digital Control Circuit

- **Key and rotary encoder input circuits**

As shown in Figure 10, signals are input directly to the microprocessor.

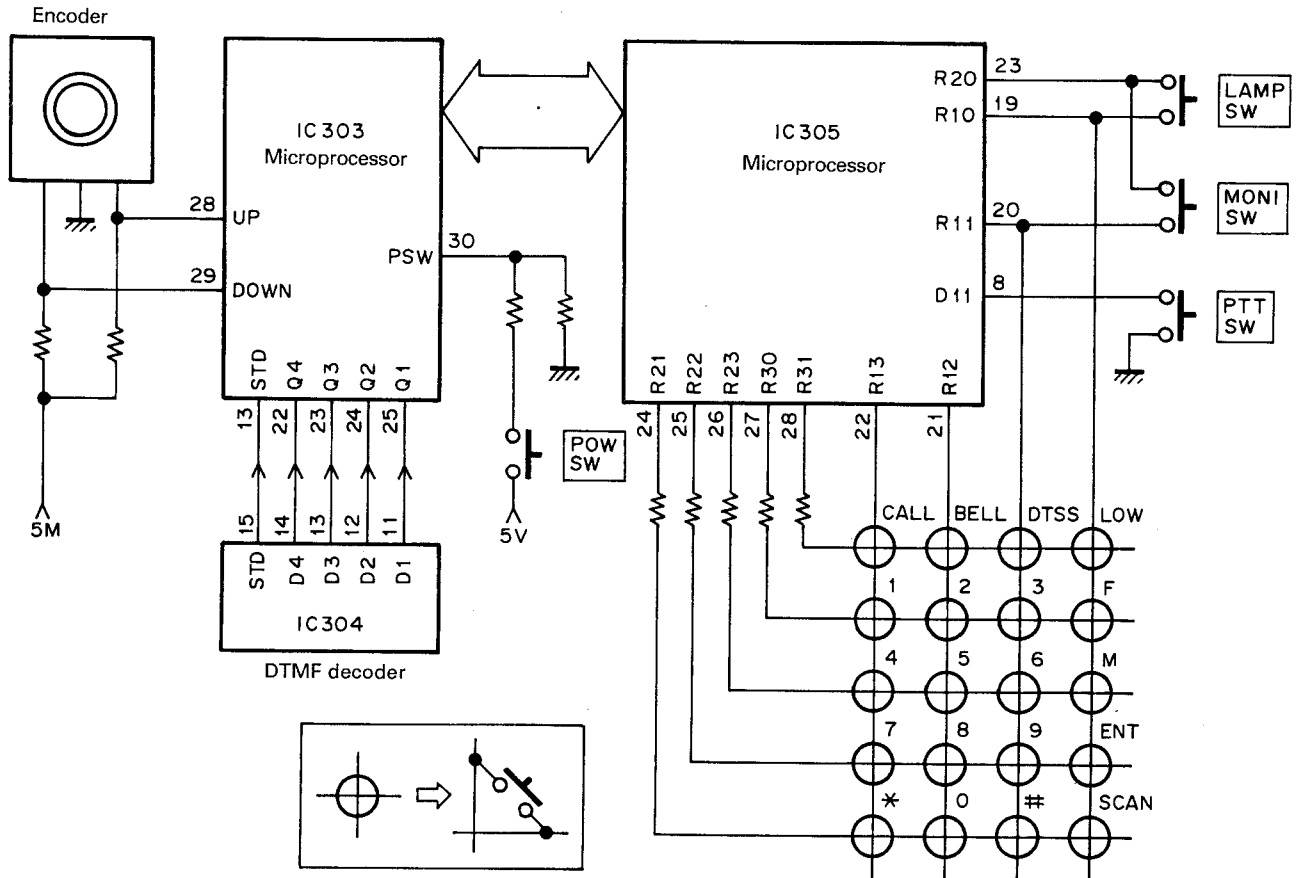


Fig. 10 Key and rotary encoder input circuits

power B is turned off. The output level is then changed from high to low. The microprocessor enters the backup state when microprocessor port INT4 is made low. Microprocessor IC305 is reset by microprocessor IC303.

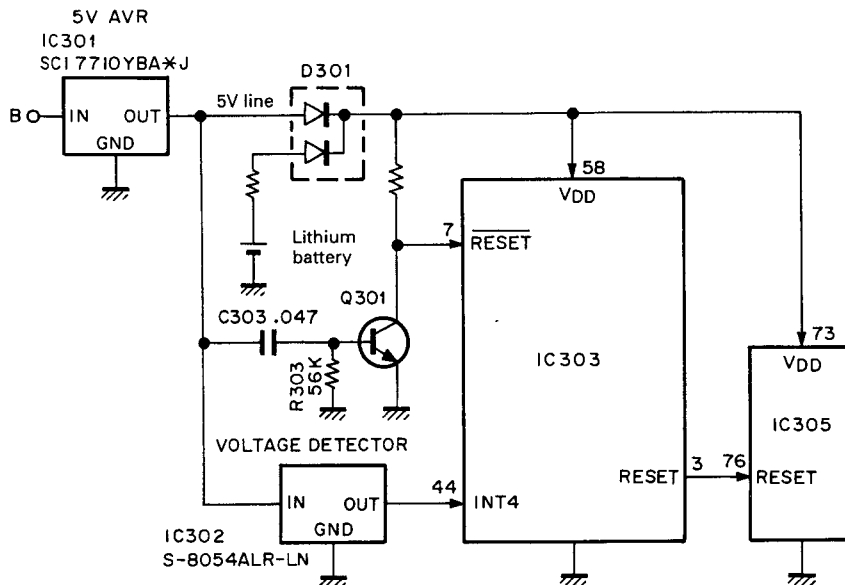
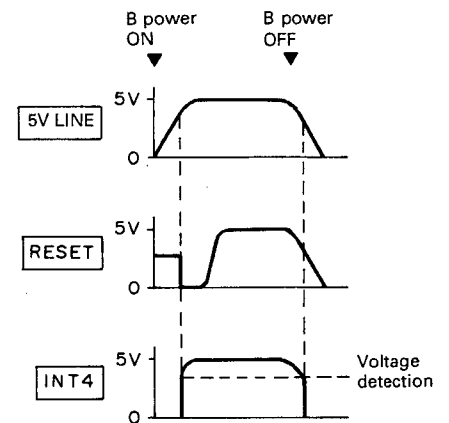


Fig. 11 Reset and backup circuits

Timing chart



The supply voltage is divided and input to the analog port of the microprocessor. The voltage input to the microprocessor is digitized to drive the LCD battery display.

The constant current circuit consisting of Q305 and D305 is switched using the output signal at the D0 pin of the microprocessor. The LED is then turned on or off.

The backup lithium battery is a rechargeable secondary lithium battery. So a charging current is supplied to the battery from the output pin of 5V AVR IC301 by LED D302. The battery voltage becomes about 3.3V when the battery is fully charged.

The lithium battery supplies current when the battery pack is removed and the external power is turned off.

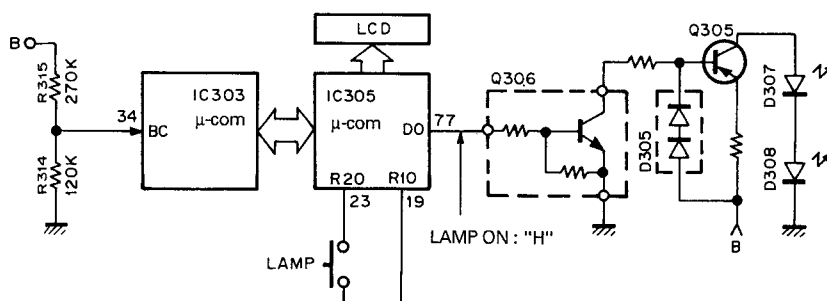


Fig. 12 Battery voltage detector and lamp circuits

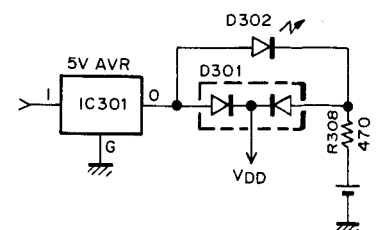


Fig. 13 Lithium battery charging circuit

CIRCUIT DESCRIPTION

Power Supply Circuit

• Ni-Cd charging circuit

A constant current of about 60mA is supplied to the Ni-Cd battery from the external power connected to the DC IN pin by the constant current circuit consisting of Q401 and D406.

• Power selector circuit

The power circuit configuration is shown in Figure 14. The power circuit branches as follows :

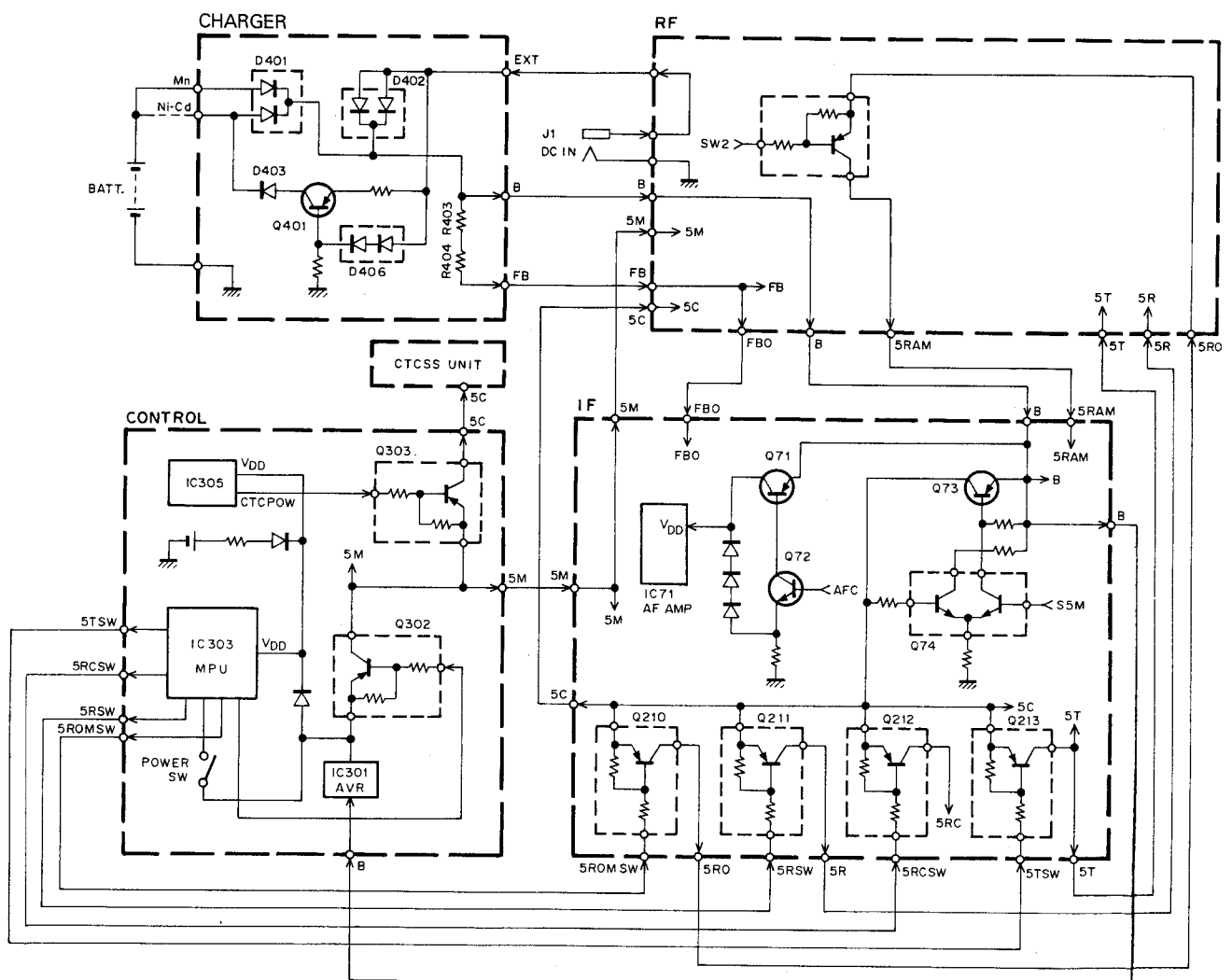
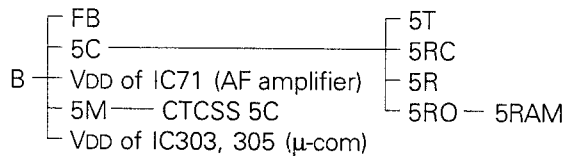


Fig. 14 Power supply circuit

CIRCUIT DESCRIPTION

• Battery save circuit

The squelch is switched in during receive (SCAN OFF). The power circuit enters the battery save mode if no key is pressed for more than ten seconds.

Q204 is then turned on or off in a 1 : 4 cycle by the signal output from the SAVE pin of the microprocessor. As a result, the power consumption in the standby state is reduced by controlling the 5C AVR circuit consisting of Q73 and Q74, turning it on or off.

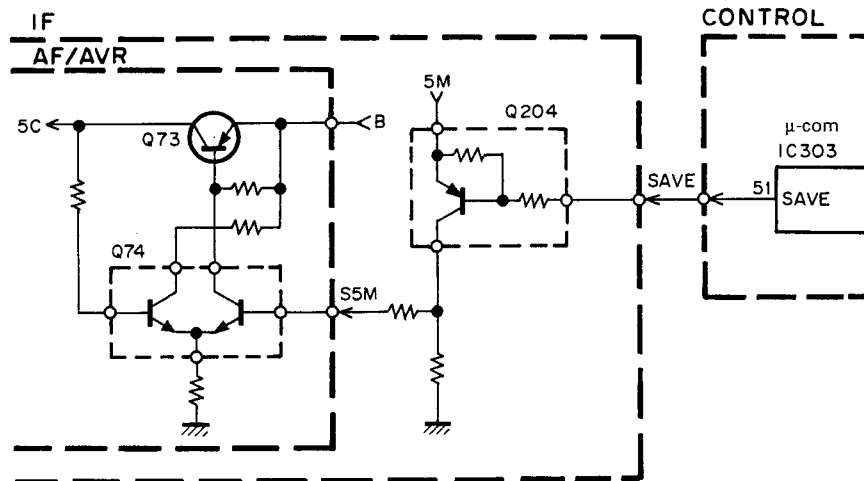
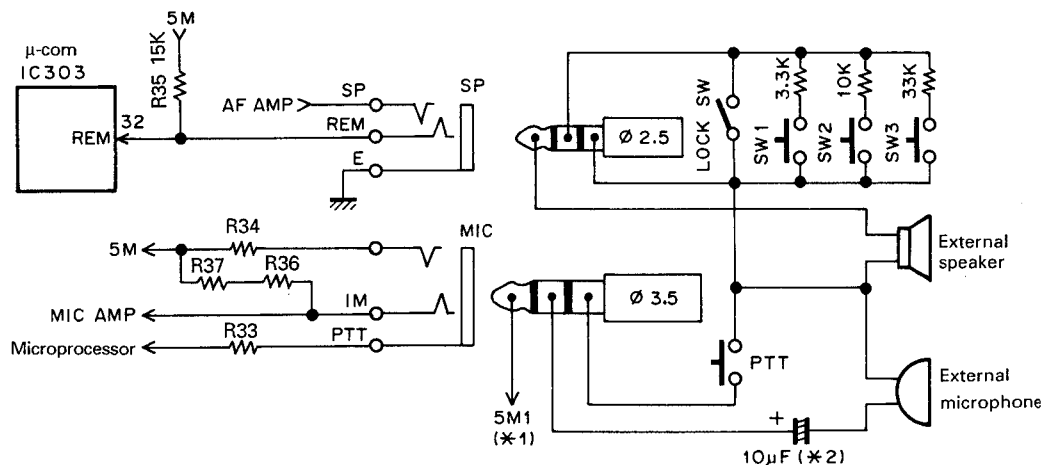


Fig. 15 Battery save circuit

• Remote control circuit

The voltage at the REM (remote) pin of the micro-processor is digitized. The remote control circuit is then remotely activated according to the digitized voltage.

The voltage at the REM pin is usually about 5V as a result of R35. When the remote control microphone switch is pressed, this voltage is divided by the resistor connected in series with the switch and by R35. The divided voltage indicates which switch was pressed.



*1: Voltage appears from the internal 5M line (5V) via R34.

*2: In the next case, the capacitor is not required.

Make the connection directly.

• In the case when a capacitor to cut DC voltage is connected to the external device.

• In the case when a two-terminal condenser microphone is used as the external microphone.

Fig. 16 Speaker, microphone jack, and remote control circuit

CIRCUIT DESCRIPTION

Supplied Circuit

• CTCSS

The tone frequency is set by the serial data from microprocessor 1 (IC303). The audio input signal is passed through a deemphasis circuit from the detection output pin and input from the CI pin.

The SDO pin is made high when the tone frequency coincides. Microprocessor 1 determines the SDO pin state and controls the MUTE pin.

• DTSS

A DTMF code is input or output as parallel data of microprocessor 1 (IC303). The audio input signal is input from the CI pin in the same way as in CTCSS. The data is sent to microprocessor 1 when a DTMF signal is detected. Microprocessor 1 determines the coincidence of the code and controls the MUTE pin.

The DTMF signal corresponding to the numeric keypad entry is output from microprocessor 2 (IC305) during DTMF signal transmission. The DTMF signal is modulated through the microphone amplifier. During DTMF signal transmission, the KM pin is made high and the microphone signal is muted. Power to the AF amplifier is then turned on, and the DTMF signal can be monitored with the speaker.

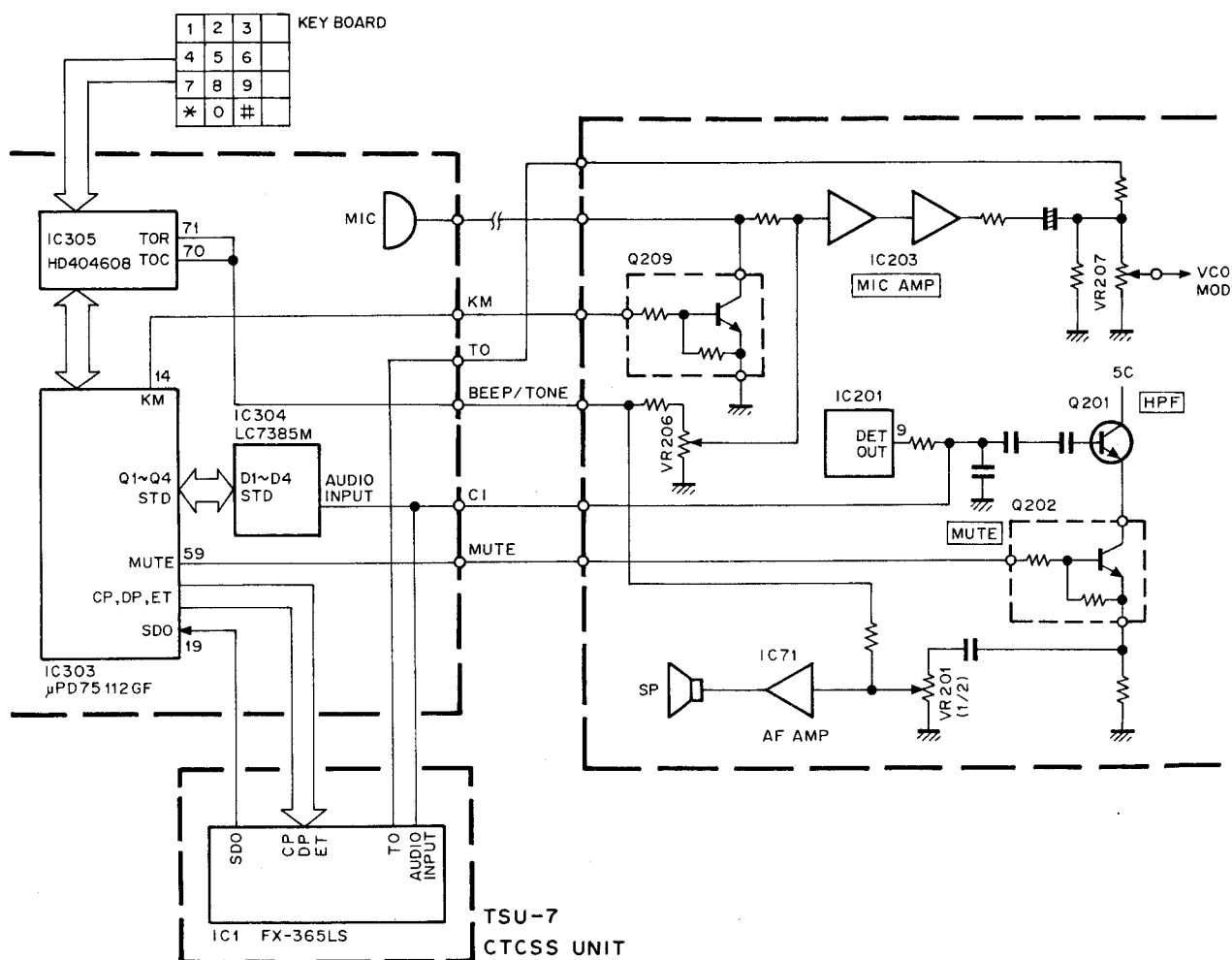


Fig. 17 Supplied circuits (DTMF, CTCSS, BEEP and TONE)

DESCRIPTION OF COMPONENTS

TX-RX UNIT (X57-364X-XX) (A/4) 0-11 : K,P 0-21 : M 0-22 : M2 0-71 : X 2-71 : T,E 2-72 : E2

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC1	PLL IC	
IC3	Transmission power amplification	
Q1	Ripple filter	5C.
Q2	RF amplifier	f in signal at PLL IC pin 5.
Q3	Switch	ON during transmission, OFF during EL (economic low power) and reception.
Q7	First-stage mixer	144MHz band to 45.05MHz IF conversion.
Q8	RF amplifier	144MHz band.
D1	RF switch	ON during reception.
D2	RF switch	ON during EL transmission.
D3	ATT	
D4, 5	Transmission/reception selection	ON during transmission, OFF during EL transmission and reception.
D6	RF switch	See the EL circuit description.
D7	RF switch	
D8~10	Receiving shift	
D11	High-level input protection	Reception input.
D12	Boosting charge	5C ripple filter.

TX-RX UNIT (X57-364X-XX) (B/4) 0-11 : K,P 0-21 : M 0-22 : M2 0-71 : X 2-71 : T,E 2-72 : E2

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC201	FM IC	2nd-stage oscillator, 2nd-stage mixer, quadrature detector, AF amplifier output, noise amplifier output, and S-meter output.
IC202	APC comparator	
IC203	Microphone amplifier	Limiter amplifier and active low-pass filter
Q201	Active high-pass filter	
Q202	AF muting	
Q203	AF control	
Q204	5M SW	SAVE.
Q205	Transmission power selection	ON when Mid power.
Q206	Transmission power selection	ON when Low power.
Q207	Constant-current source	
Q208	Transmission power selection	OFF during EL.
Q209	MIC input switch	DTMF ON : MIC MUTE
Q211	5R SW	
Q212	5RC SW	
Q213	5T SW	
D201	APC SW	
D202	Reference voltage	APC.
D204	AFC SW	

DESCRIPTION OF COMPONENTS

TX-RX UNIT (X57-364X-XX) (C/4) 0-11 : K,P 0-21 : M 0-22 : M2 0-71 : X 2-71 : T,E 2-72 : E2

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC301	5V AVR	
IC302	Voltage detection	The detection voltage is 4.3 to 4.6V.
IC303	Microprocessor	
IC304	DTMF receiver	
IC305	Microprocessor	
Q301	Reset output	
Q302	5M SW	5M SW "L" : ON.
Q303	CTCSS SW	CTCSS or TSU-7 (option) power switch. CTCPOW "L" : ON
Q305	Lamp power	35mA constant current.
Q306	Lamp switch	LAMP "H" : ON
D301	Microprocessor power supply	
D302	Lithium battery charge	A second lithium battery is charged to 3.4V.
D303	Microprocessor noise elimination	
D305	Constant-current setting	
D306	LED	ON AIR
D307, 308	LED	LAMP

TX-RX UNIT (X57-364X-XX) (D/4) 0-11 : K,P 0-21 : M 0-22 : M2 0-71 : X 2-71 : T,E 2-72 : E2

Ref. No.	Use/Function	Operation/Condition/Compatibility
Q401	Constant-current circuit	Charging
D401~403	Reverse-current prevention	
D404	Protection	Surge protection
D405	Constant-current circuit	

SUB UNIT (X58-3750-XX) : A2 -00 : K,P -11 : M,M2,X,T,E,E2

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC51	AM demodulation	K, P type only.
IC71	AF power amplifier	
Q1	Noise amplifier	
Q2	DC SW	Inverter.
Q3	DC SW	Q1 gain control.
Q11	DC SW	Control ELO with EL signal.
Q12	DC SW	Controls D2 and D6 (1/2) with ELO.
Q13	DC SW	Controls SFB with EL signal.
Q14	DC SW	Controls S5T with Q15.
Q15	DC SW	Controls Q14 with EL signal.
Q21	RF power amplification	Initial stage of drive circuit.
Q22	RF power amplification	Last stage of drive circuit.
Q41	First-stage IF amplifier	AGC is provided (during AM).
Q51	Electronic VR	Bias current at base of Q41 for AGC. K, P type only
Q52	Mute switch	FM demodulation muting. K, P type only
Q53	AF amplifier	AF sensitivity compensation for AM. K, P type only

DESCRIPTION OF COMPONENTS

Ref. No.	Use/Function	Operation/Condition/Compatibility
Q71	AVR	AF amplifier power.
Q72	Error amplification	Q17 bias control.
Q73	AVR	5C.
Q74	Differential DC amplifier	
D1	Noise rectification	Voltage multiplier.
D2	Constant-voltage shift	Squelch hysteresis.
D21	RF SW	ON during transmission.
D22	Bias	
D71	DC SW	Capacitor discharge prevention.
D72, 73	Constant-voltage shift	Used for AF IC AVR.

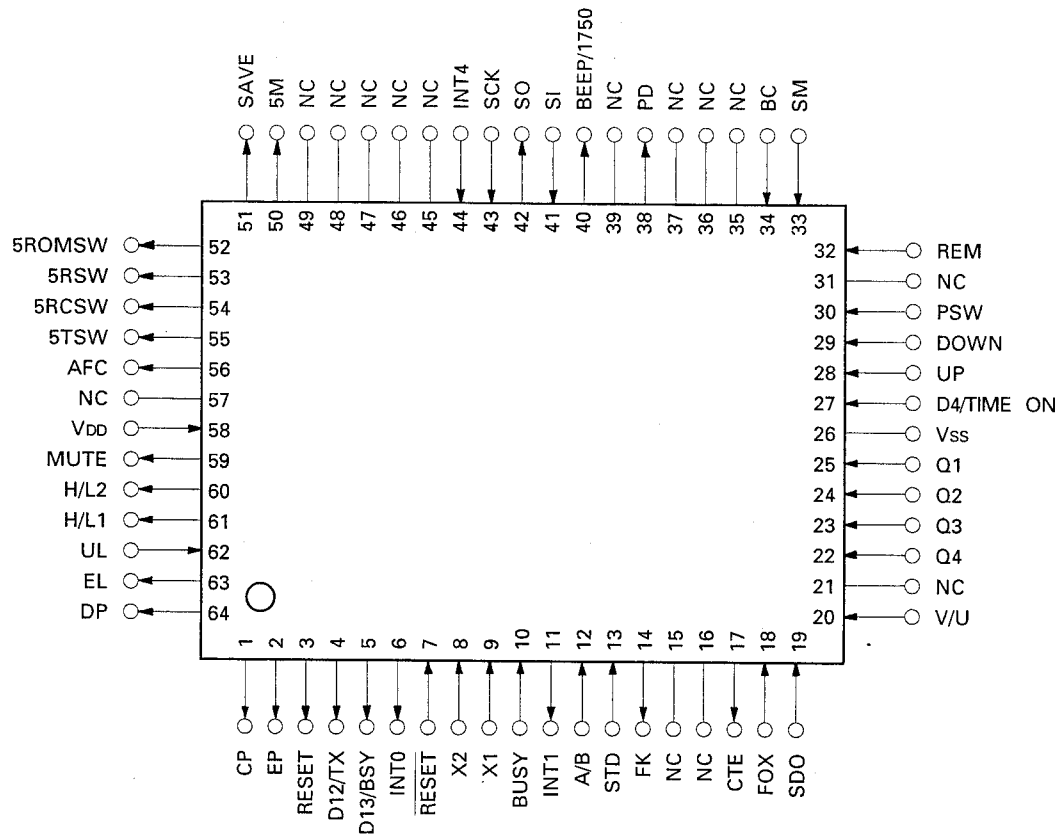
SUB UNIT : VCO (X58-3740-00) : A1

Ref. No.	Use/Function	Operation/Condition/Compatibility
Q1	SW	Controls D4, OFF during reception.
Q2	VCO	RX : Transmitting frequency + 45.05MHz, TX : Transmitting frequency
Q3, 4	Buffer amplifier	
D1, 2	VCO frequency control	
D3	Modulation	
D4	Frequency shift	ON during reception, OFF during transmission.

SEMICONDUCTOR DATA

Microprocessor : 75112GF-583-3BE or 75112GF-596-3BE (TX-RX unit IC303)

• Terminal connection diagram



• Terminal function

Pin No.	Name	I/O	Description
1	CP	O	PLL and CTCSS clocks
2	EP	O	PLL enable
3	RESET	O	IC305 is reset. "H" : Reset
4	D12/TX	O	Transmission request output
5	D13/BSY	O	BUSY output
6	INT0	O	INT0 of IC305. "L" : Active (power on)
7	RESET	I	Reset input.
8	X2	I	Used for clock oscillation.
9	X1	I	Used for clock oscillation.
10	BUSY	I	SQ BUSY input. "H" : BUSY
11	INT1	O	INT1 of IC305. "L" : Active (power off)
12	A/B	I	
13	STD	I	DTMF decoder tone is detected. "H" : Detected, "L" : Not detected
14	KM	O	Microphone muting. "H" : On, "L" : Off
15,16			NC (GND)

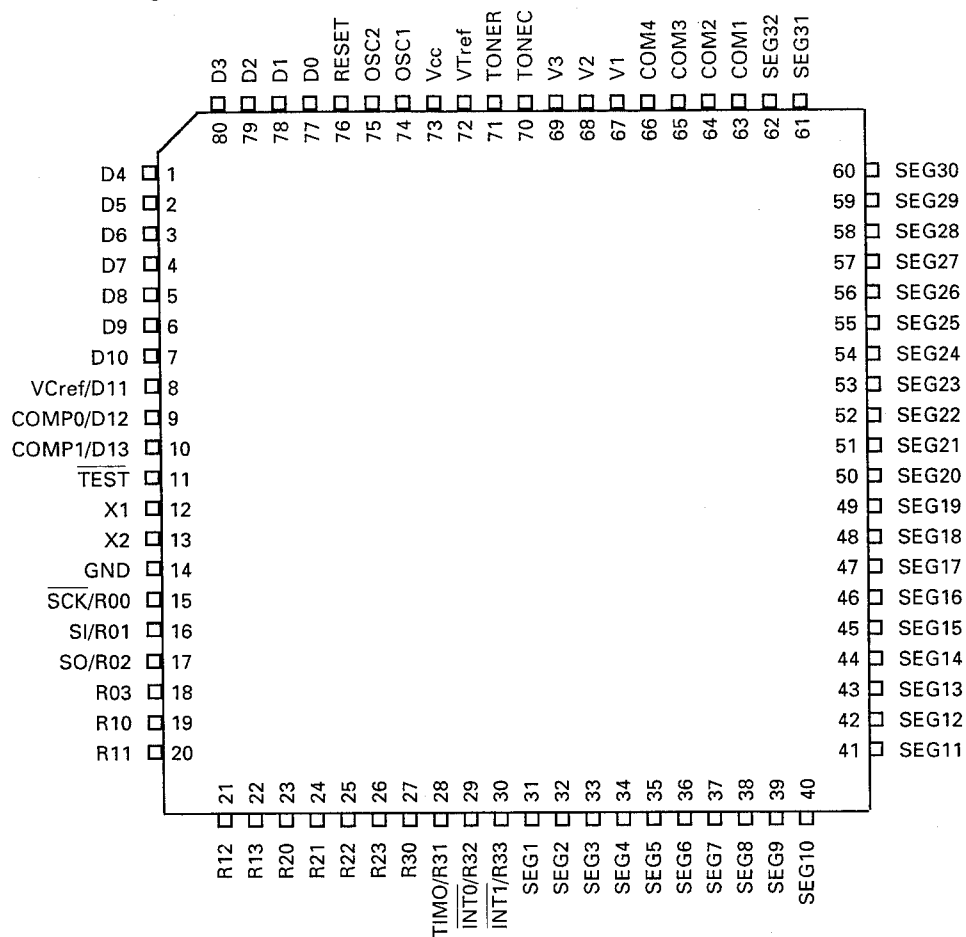
SEMICONDUCTOR DATA

Pin No.	Name	I/O	Description
17	CTE	O	CTCSS (TSU-7) strobe
18	FOX	I	
19	SDO	I	CTCSS (TSU-7) tone detection. "L" : Coincides, "H" : Does not coincide
20	V/U	I	VHF/UHF selection. "L" : VHF, "H" : UHF
21			NC (GND)
22~25	Q4~Q1	I	DTMF decoder input
26	Vss		GND
27	D4/TIME ON	I	On timer power-on request. "H" : Active
28	UP	I	Encoder UP signal
29	DOWN	I	Encoder DOWN signal
30	PSW	I	Power switch. "H" : On, "L" : Off
31			NC (GND)
32	REM	I	Remote control microphone input
33	SM	I	S-meter input
34	BC	I	Battery input
35~37			NC (GND)
38	PD	O	PD of IC304. "H" : Power down, "L" : Active
39			NC (GND)
40	BEEP/1750	O	1750Hz, BEEP output
41	SI	I	Serial input
42	SO	O	Serial output
43	SCK	I	Clock
44	INT4	I	Power supply (battery) detection. "H" : Detected, "L" : Not detected
45~49			NC (GND)
50	5M	O	5M power switch. "L" : On
51	SAVE	O	Save. "H" : On
52	5ROMSW	O	
53	5RSW	O	VHF 5R control. "L" : On
54	5RCSW	O	IF power 5RC control. "L" : On
55	5TSW	O	Transmission 5T control. "L" : On
56	AFC	O	AF amplifier power control. "L" : On
57			NC (OPEN)
58	VDD	I	Power supply
59	MUTE	O	AF MUTE. "L" : On, "H" : Off
60	H/L2	O	Transmission output selection. "L" : Low, "H" : Mid, "L" : High
61	H/L1	O	Transmission output selection. "H" : Low, "L" : Mid, "L" : High
62	UL	I	Unlock detection. "L" : Lock, "H" : Unlock
63	EL	O	Economic low power. "L" : On, "H" : Off
64	DP	O	PLL and CTCSS data

SEMICONDUCTOR DATA

Microprocessor : HD404608A80H (TX-RX UNIT IC305)

- Terminal connection diagram



SEMICONDUCTOR DATA

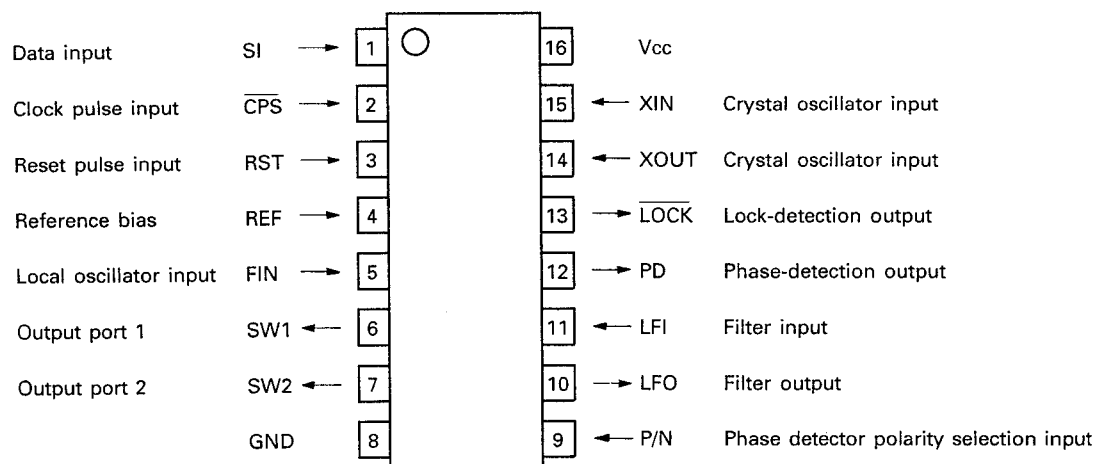
• Terminal function

Pin No.	Name	I/O	Description
1	D4	O	On timer power-on request. "H" : Active
2	D5	O	CTCSS (TSU-7) power on/off. "L" : On, "Open" : Off
3	D6	O	NC
4	D7	I	
5	D8	I	
6	D9	I	
7	D10	I	
8	D11/VCref	I	PTT switch input. "L" : TX
9	D12/COMP0	I	Transmission request input. "H" : Active
10	D13/COMP1	I	BUSY input. "H" : Active
11	TEST		
12	X1	I	Clock oscillator
13	X2	I	Clock oscillator
14	GND		Ground
15	R00/SCK	O	Clock
16	R01/SI	I	Serial input
17	R02/SO	O	Serial output
18	R03	O	NC
19~22	R10~R13	O	Key matrix output
23~26	R20~R23	I	Key matrix input
27, 28	R30, R31	I	Key matrix input
29	R32/INT0	I	Power-on request
30	R33/INT1	I	Backup control
31~60	SEG1~SEG30	O	LCD display segment signal
61, 62	SEG31, SEG32		NC
63~65	COM1~COM3	O	LCD display common signal
66	COM4		NC
67~69	V1~V3		NC
70	TONEC	O	DTMF signal output
71	TONER	O	DTMF signal output
72	VTref	I	DTMF output setting
73	Vdd	I	Power supply
74	OSC1	I	Clock oscillation.
75	OSC2	I	Clock oscillation.
76	RESET	I	Reset
77	D0	O	Lamp on/off. "H" : On, "L" : Off
78	D1	O	ON AIR LED. "L" : On
79	D2		NC
80	D3	I	Battery detection. "H" : Detected, "L" : Not detected

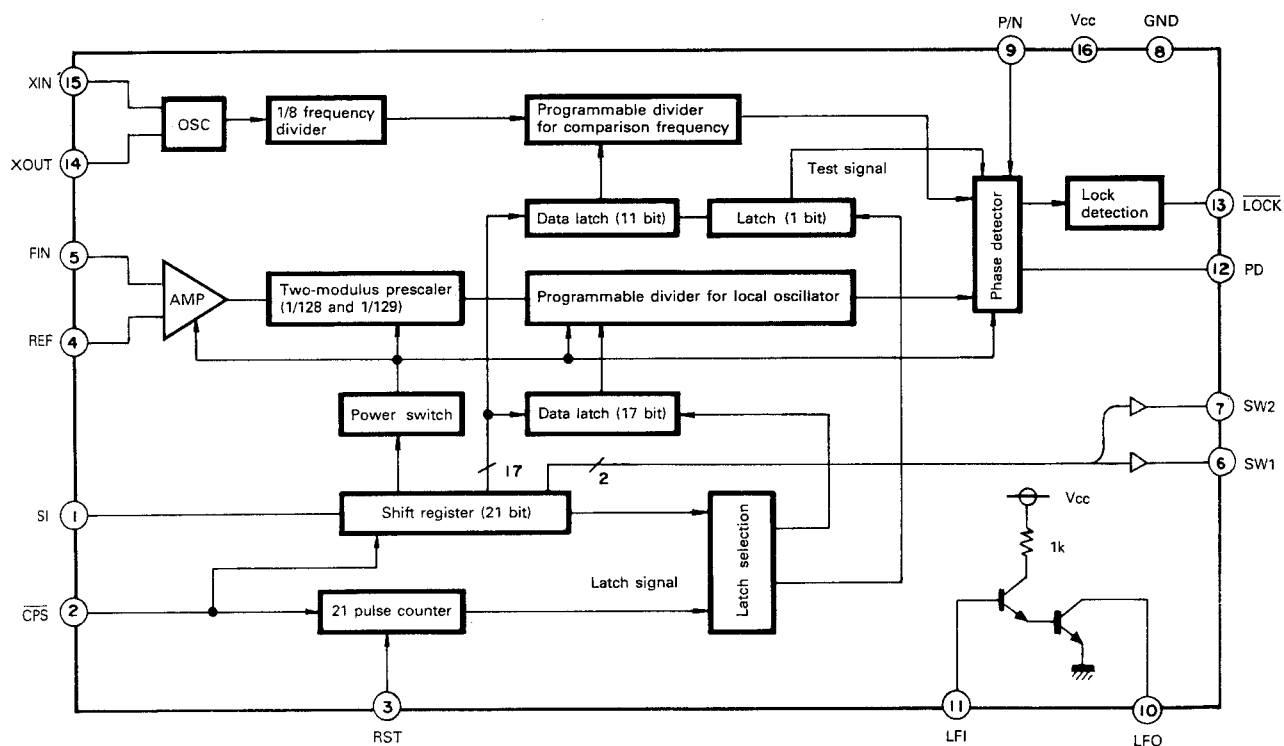
SEMICONDUCTOR DATA

PLL IC : M56760FP (TX-RX unit IC1)

• Terminal connection diagram



• Block diagram



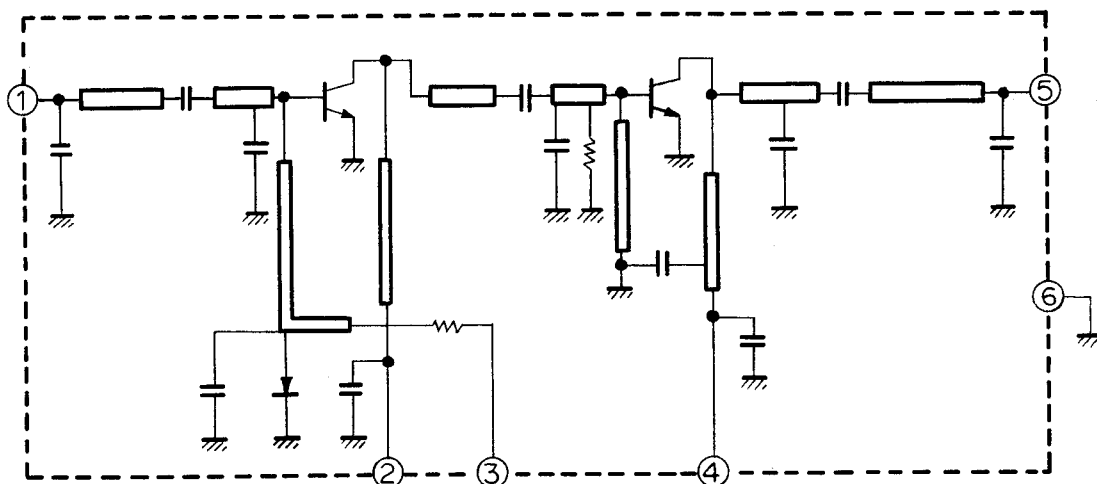
SEMICONDUCTOR DATA

• Terminal function

Pin No.	Symbol	Name	Description
1	SI	Data input	Data input
2	CPS	Clock pulse input	Clock pulse input
3	RST	Reset pulse input	Reset pulse input
4	REF	Reference bias	Connected to ground via a 1000pF capacitor.
5	FIN	Local oscillator input	VCO input. $f_{max} = 540\text{MHz}$
6	SW1	Output port 1	Output port in which the status can be set by the transfer data from the controller
7	SW2	Output port 2	
8	GND	Ground	0V
9	P/N		GND
10	LFO		NC
11	LFI		NC
12	PD	Phase-detection output	Tristate output
13	LOCK	Lock-detection output	"L" : Lock, "H" : Unlock
14	XOUT	Crystal oscillator output	Inputs a 12.8MHz signal to the XIN pin.
15	XIN		
16	Vcc	Power supply pin	3.0~5.5V

Transmission Power Amplifier : S-AV22A (TX-RX unit IC3)

• Equivalent circuit



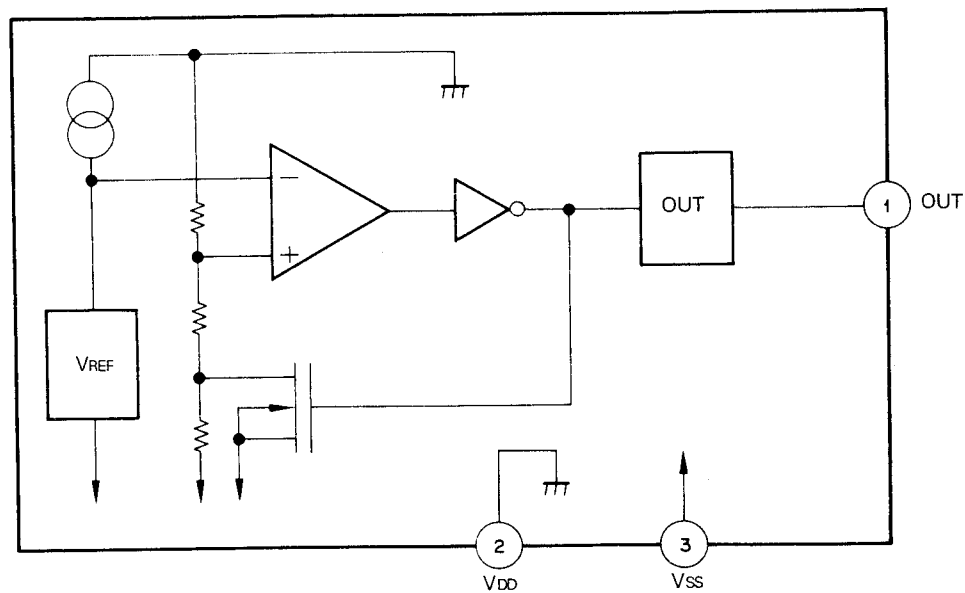
• Maximum ratings (Tc = 25°C)

Item	Symbol	Rating	Unit
Supply voltage	Vcc	16	V
Control voltage	VCON	16	V
Bias voltage	VBB	5.5	V
Input voltage	Pi	30	mW
Output voltage	Po	10	W
Total current	IT	2	A
Operating temperature	Tc(opr)	-30 ~ 100	°C
Storage temperature	Tstg	-40 ~ 110	°C

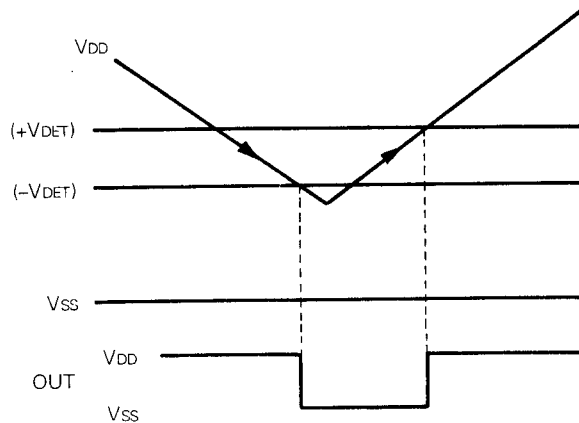
1. Pi : High frequency input
2. V1 : VCON terminal
3. V2 : VBB terminal
4. V3 : VCC terminal
5. Po : High frequency output
6. GND (Flange)

Voltage Detection : S-8054ALR-LM (TX-RX unit IC302)

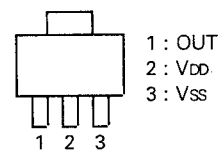
- Block diagram



- Operating timing chart



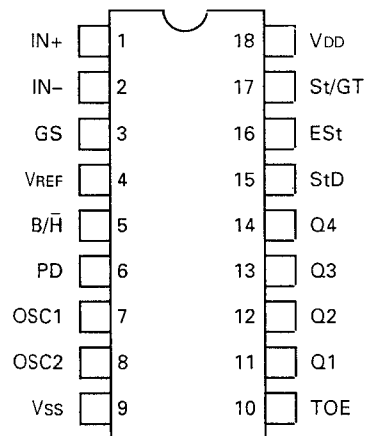
- Pin connection



SEMICONDUCTOR DATA

DTMF Receiver : LC7385M (TX-RX unit IC304)

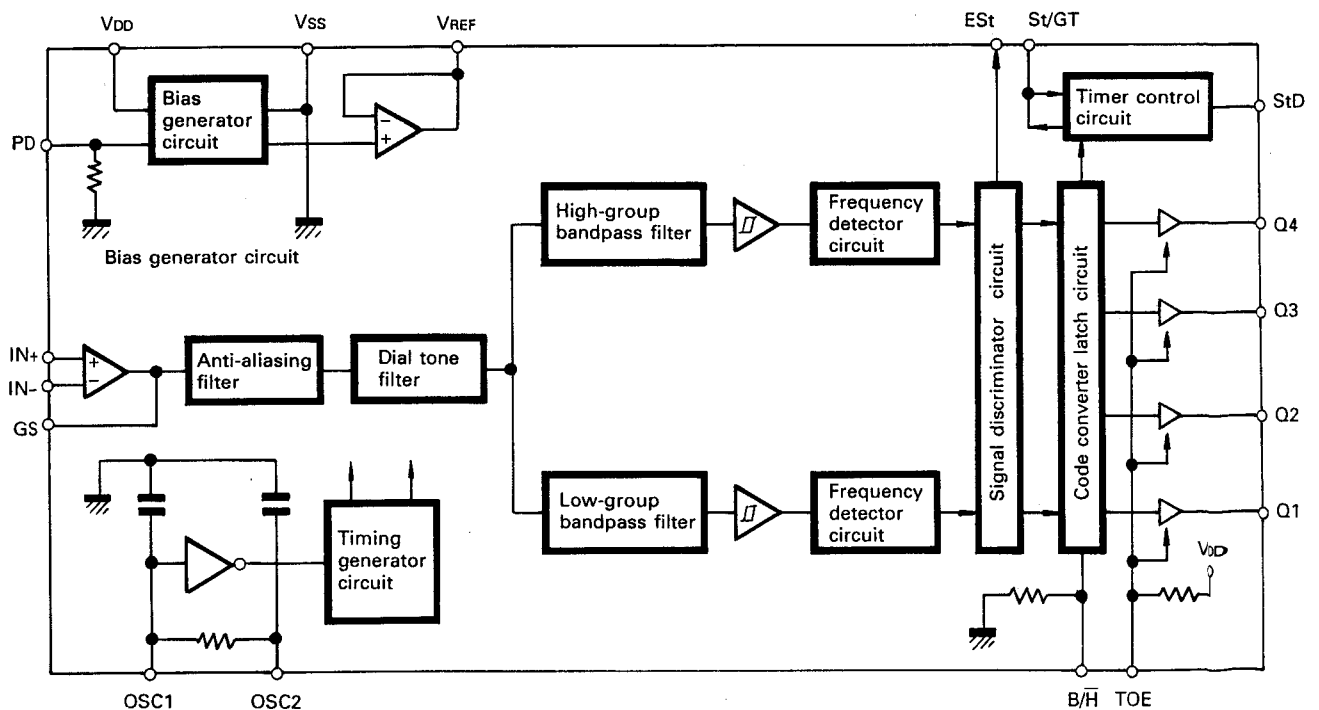
• Terminal connection diagram



• Terminal function

Pin No.	Name	I/O	Description
1	IN+	I	Non-inverting input of input amplifier
2	IN-	I	Inverting input of input amplifier
3	GS	O	Input amplifier output
4	VREF	O	VDD/2
5	B/H	I	Usually set : "L"
6	PD	I	"H" : Power-down mode
7	OSC1	I	3.579545MHz input
8	OSC2	O	
9	Vss		Usually set to 0V
10	TOE	I	Usually set : "H"
11~14	Q1~Q4	O	Tristate receive data output
15	StD	O	"H" when the duration time of tone pairs is exceeded
16	ESd	O	"H" when tone pairs coincide
17	St/GT	I/O	Guard time setting
18	VDD		Power supply pin. Usually set to 5V.

• Block diagram



TH-27A/E

PARTS LIST

※ New Parts

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TH-27A/E

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
TH-27A/E						
1	3D	*	A01-2011-03	METALLIC CABINET(REAR)		
2	3B	*	A02-1512-03	CASE ASSY	KM1M2X	
2	3B	*	A02-1512-03	CASE ASSY	P	
2	3B	*	A02-1513-03	CASE ASSY	TE1E2	
3	2C	*	A62-0031-04	PANEL ASSY		
4	3D	*	B09-0324-03	CAP (DC IN)		
		*	B42-3343-04	S/No LABEL (RADIO)		
		*	B42-3394-04	FCC PLATE	K	
		*	B46-0410-20	WARRANTY CARD	K	
		*	B46-0419-00	WARRANTY CARD	E1E2	
		*	B46-0422-00	WARRANTY CARD	P	
		*	B62-0046-00	INSTRUCTION MANUAL (ENGLISH)	KTX	
		*	B62-0047-00	INSTRUCTION MANUAL (EN,SP,FR)	M1M2P	
		*	B62-0047-00	INSTRUCTION MANUAL (EN,SP,FR)	E1E2	
		*	B62-0048-00	INSTRUCTION MANUAL (GE,IT,DU)	E1E2	
6	1A	*	B72-0076-04	MODEL NAME PLATE (TH-27A FCC)	KP	
6	1A	*	B72-0077-04	MODEL NAME PLATE (TH-27A)	M1M2X	
6	1A	*	B72-0078-04	MODEL NAME PLATE (TH-27E)	TE1E2	
7	3D	*	D10-0608-03	LEVER (RELEASE)		
8	2C	*	E04-0160-05	BNC RECEPTACLE		
		*	E19-0254-05	AC PLAC	M1M2	
		*	E23-0664-04	DC TERMINAL		
10	3A	*	E37-0031-15	CONNECTING WIRE (SP)		
12	2D	*	E37-0032-15	CONNECTING WIRE (RF-CHARGE)		
15	2C	*	E40-5343-05	CONNECTOR (CTCSS FPC)		
		*	F10-1455-12	SHIELDING PLATE		
		*	F20-1051-04	INSULATING BOARD(CHARGE UNIT)		
		*	F20-1055-04	INSULATING BOARD(LITHIUM BATT)		
		*	F29-0435-05	INSULATOR (BELT FOOK)		
19	1D	*	F29-0443-05	INSULATING TUBE (AVR TR)		
20	2D	*	G01-0856-04	COIL SPRING		
21	2C	*	G02-0505-05	KNOB FIXD SPRING		
22	3D	*	G10-0692-04	NON-WOVEN FABRIC(CTCSS)	K	
		*	G11-0646-04	SOFT TAPE (RELEASE)		
		*	G13-0816-04	FORMED PLATE (CTCSS FPC)	PE1E2	
25	1C	*	G13-0816-04	FORMED PLATE (CTCSS FPC)	M1M2TX	
		*	G53-0704-03	PACKING		
		*	H10-2704-02	POLYSTYRENE FOAMED FIXTURE		
		*	H11-0808-14	POLYSTYRENE PLATE	KTX	
		*	H11-0842-04	POLYSTYRENE PLATE(CHARGER)	KP	
		*	H11-0843-14	POLYSTYRENE PLATE(CHARGER)	XE1E2	
		*	H11-0845-04	POLYSTYRENE PLATE(CHARGER)	KPXT	
		*	H11-0845-04	POLYSTYRENE PLATE(CHARGER)	E1E2	
		*	H13-0823-04	PROTECTION PLATE	M1M2P	
		*	H13-0843-04	PROTECTION PLATE	E1E2	
		*	H21-0720-04	PROTECTION SHEET (RADIO)		
		*	H25-0085-04	PROTECTION BAG(RADIO 100X200)		
		*	H52-0042-04	ITEM CARTON BOX (TH-27A)	KM1M2X	
		*	H52-0042-04	ITEM CARTON BOX (TH-27A)	P	
		*	H52-0043-04	ITEM CARTON BOX (TH-27E)	TE1E2	

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TH-27E : T,E,E2

PARTS LIST

× New Parts

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TH-27A/E

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
30	1D	*	J19-1468-13	HOLDER (CHARGE UNIT)		
31	2A	*	J19-1469-14	HOLDER (16KEY)		
32	1D	*	J21-4319-04	MOUNTING HARDWARE(CHARGE UNIT)		
33	2D	*	J21-4320-04	MOUNTING HARDWARE(RELEASE)		
34	1B	*	J21-4322-04	MOUNTING HARDWARE(PTT)		
35	1D	*	J21-4334-04	MOUNTING HARDWARE(AVR TR)		
		*	J29-0459-04	BELT FOOT		
36	3B	*	J39-0441-04	SPACER (MIC)		
37		*	J39-0442-14	SPACER (BNC)		
29	2C	*	J39-0445-04	FLAT WASHER (AF VOL)		
			J69-0312-04	HAND STRAP		
38	1C	*	J82-0001-05	FPC (RF-1F)		
39	2A	*	J82-0002-05	FPC (IF-CONT)		
40	2A	*	J82-0003-05	FPC (CTCSS)		
41	3A	*	J82-0004-05	FPC (16KEY)		
42	2B	*	J99-0317-04	ADHESIVE SHEET (LITHIUM BATT)		
43	2A	*	J99-0321-04	ADHESIVE SHEET (CTCSS UNIT)	KP	
45	3D	*	K29-4597-04	KNOB (RELEASE)		
46	2C	*	K29-4598-14	KNOB (VOLUME)		
47	2C	*	K29-4600-04	KNOB (ENCODER)		
48	3B	*	K29-4601-03	KNOB (PTT)		
49	3B	*	K29-4602-03	KNOB (POWER)		
51	2C	*	K29-4638-04	KNOB (SQUELCH)		
50	3A	*	K29-4639-13	KNOB (KEY TOP)		
A	1A		N09-2028-05	SCREW (M3X4)		
B	1B2B		N09-2086-05	SCREW (M2X5)		
C	1D	*	N09-2087-15	SCREW (M2X3.5)		
D	1A		N09-2107-05	SCREW (M2X12)		
E	1D2C	*	N09-2125-05	SCREW (M2X3.5)		
F	2A	*	N09-2126-05	SCREW (M2X3)		
G	3D	*	N09-2127-05	SCREW (M2X3.5)		
H	1D	*	N09-2138-05	SCREW (M2X10)		
55	3C	*	N14-0549-04	NUT (BNC)		
56	2C	*	N14-0550-04	NUT (VOLUME/ENCODER)		
J	1A		N30-2003-45	BINDING HEAD MACHINE SCREW		
K	1D3D		N39-2045-45	PAN HEAD MACHINE SCREW		
L	2D	*	N39-2635-45	PAN HEAD MACHINE SCREW		
60	3B	*	T07-0266-05	LOUDSPEAKER		
		*	T90-0420-05	ANTENNA		
63	1B	*	W03-2019-05	KEYBOARD ASSY (PTT)		
		*	W09-0563-05	BATTERY PACK		
		*	W09-0565-05	BATTERY CHARGER	KP	
		*	W09-0566-05	BATTERY CHARGER	M1M2	
		*	W09-0567-05	BATTERY CHARGER	X	
		*	W09-0568-05	BATTERY CHARGER	T	
		*	W09-0569-05	BATTERY CHARGER	E1E2	
64	2B	*	W09-0570-05	LITHIUM BATTERY		
65	2A		X52-3170-00	CTCSS UNIT (TSU-7)	KP	
66	1C2B	*	X57-3640-11	TX-RX UNIT	KP	
66	1C2B	*	X57-3640-21	TX-RX UNIT	M	
66	1C2B	*	X57-3640-22	TX-RX UNIT	M	
66	1C2B	*	X57-3640-71	TX-RX UNIT	X	

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TH-27E : T,E,E2

△ indicates safety critical components.

PARTS LIST

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TH-27A/E

TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
66	1C2B	*	X57-3642-71	TX-RX UNIT	TE	
66	1C2B	*	X57-3642-72	TX-RX UNIT	E	
TX-RX UNIT (X57-364X-XX) 0-11 : K,P 0-21 : M 0-22 : M2 0-71 : X 2-71 : T,E 2-72 : E2						
100	2B	*	B11-0492-04	FILTER		
101	2B	*	B38-0349-05	DISPLAY ASSY		
D302		*	B30-0897-05	LED (CHG)		
D306		*	B30-0880-05	LED (ON AIR)		
D307, 308		*	B30-0897-05	LED (LAMP)		
C1			C92-0038-05	ELECTRØ 22UF 16WV		
C2 -4			CK73GB1H102K	CHIP C 1000PF K		
C5			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		
C6			CC73GCH1H330J	CHIP C 33PF J		
C7			CC73GCH1H120J	CHIP C 12PF J		
C8			C92-0045-05	ELECTRØ 22UF 6.3WV		
C9 ,10			CK73GB1H102K	CHIP C 1000PF K		
C11			C92-0001-05	CHIP-TAN 0.1UF 35WV		
C12			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		
C14			CK73FB1E333K	CHIP C 0.033UF K		
C15 -17			CK73GB1H102K	CHIP C 1000PF K		
C18			CK73GB1H103K	CHIP C 0.01UF K		
C19			CK73GB1H102K	CHIP C 1000PF K		
C20			CK73GB1H103K	CHIP C 0.01UF K		
C21			C92-0045-05	ELECTRØ 22UF 6.3WV		
C22			CK73GB1H102K	CHIP C 1000PF K		
C23			CK73FB1E104K	CHIP C 0.10UF K		
C24			C92-0040-05	ELECTRØ 47UF 16WV		
C25			CK73GB1H102K	CHIP C 1000PF K		
C26			CK73FB1E104K	CHIP C 0.10UF K		
C27			CC73GCH1H270J	CHIP C 27PF J		
C28			CC73GCH1H050C	CHIP C 5PF C		
C29			CC73GCH1H270J	CHIP C 27PF J		
C30			CC73GCH1H030C	CHIP C 3PF C		
C31		*	CC73GCH1H240J	CHIP C 24PF J		
C32			CK73GB1H102K	CHIP C 1000PF K		
C33			CC73GCH1H270J	CHIP C 27PF J		
C34			CC73GCH1H030C	CHIP C 3PF C		
C35 ,36			CK73GB1H102K	CHIP C 1000PF K		
C37			CK73FB1H102K	CHIP C 1000PF K		
C38		*	C92-0523-05			
C41			CK73GB1H102K	CHIP C 1000PF K		
C42			CC73GCH1H080D	CHIP C 8PF D		
C43 ,44			CK73GB1H102K	CHIP C 1000PF K		
C45			CC73GCH1H050C	CHIP C 5PF C		
C46			CC73GCH1H470J	CHIP C 47F J		
C48			CC73GCH1H070D	CHIP C 7PF D		
C48			CC73GCH1H080D	CHIP C 8PF D		
C49 -51			CK73GB1H102K	CHIP C 1000PF K		
C53			CC73GCH1H060D	CHIP C 6PF D		
C53			CC73GCH1H090D	CHIP C 9PF D		
C54 -56			CK73GB1H102K	CHIP C 1000PF K		
C58			CC73GCH1H060D	CHIP C 6PF D		
C58			CC73GCH1H100D	CHIP C 10PF D		
C59			CC73GCH1H150J	CHIP C 15PF J		
C63 ,64			CK73GB1H102K	CHIP C 1000PF K		

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PARTS LIST

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TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C201, 202			CK73GB1H103K	CHIP C 0.01UF K		
C203			CC73GCH1H270J	CHIP C 27PF J		
C204			CC73GCH1H150J	CHIP C 15PF J		
C205			CK73GB1H103K	CHIP C 0.01UF K		
C206			CK73FB1E104K	CHIP C 0.10UF K		
C207			CK73GB1H103K	CHIP C 0.01UF K		
C208, 209			CK73FB1E104K	CHIP C 0.10UF K		
C210			CC73GCH1H270J	CHIP C 27PF J		
C212			CK73FB1E104K	CHIP C 0.10UF K		
C213			CK73GB1H103K	CHIP C 0.01UF K		
C214			C90-2049-05	ELECTRO 15UF 6.3WV		
C215			CK73GB1H103K	CHIP C 0.01UF K		
C216, 217			CK73GB1H471K	CHIP C 470PF K		
C218			CK73GB1H102K	CHIP C 1000PF K		
C219			CK73FB1E104K	CHIP C 0.10UF K		
C220, 221			CK73GB1E223K	CHIP C 0.022UF K		
C222			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C223			CK73FB1E104K	CHIP C 0.10UF K		
C224			CK73FB1H333K	CHIP C 0.033UF K		
C225			CK73GB1H103K	CHIP C 0.01UF K		
C227			C90-2052-05	ELECTRO 68UF 10WV		
C228			C92-0004-05	CHIP-TAN 1.0UF 10WV		
C229			CK73FB1E473K	CHIP C 0.047UF K		
C230			CK73GB1H471K	CHIP C 470PF K		
C231			C92-0047-05	ELECTRO 47UF 6.3WV		
C232-237			CK73GB1H471K	CHIP C 470PF K		
C238			CC73GCH1H151J	CHIP C 150PF J		
C239			CK73GB1H471K	CHIP C 470PF K		
C240			C92-0002-05	CHIP-TAN 0.22UF 35WV		
C241			CK73GB1H471K	CHIP C 470PF K		
C242, 243			CK73GB1H103K	CHIP C 0.01UF K		
C244			C92-0002-05	CHIP-TAN 0.22UF 35WV		
C245			CK73GB1H103K	CHIP C 0.01UF K		
C246			CK73GB1E223K	CHIP C 0.022UF K		
C247			CK73GB1H471K	CHIP C 470PF K		
C248, 249			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C250			CK73GB1H471K	CHIP C 470PF K		
C251			CC73GCH1H151J	CHIP C 150PF J		
C252			CK73GB1H182K	CHIP C 1800PF K		
C253			CK73GB1H103K	CHIP C 0.01UF K		
C254			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		
C255			CK73GB1H471K	CHIP C 470PF K		
C256-258			CK73GB1H471K	CHIP C 470PF K		
C259			C92-0004-05	CHIP-TAN 1.0UF 10WV		
C301			CK73GB1H332K	CHIP C 3300PF K		
C302			CK73GB1H103K	CHIP C 0.01UF K		
C303			CK73FB1E473K	CHIP C 0.047UF K		
C304-306			CK73GB1H471K	CHIP C 470PF K		
C307, 308			CC73GCH1H270J	CHIP C 27PF J		
C309-311			CK73GB1H471K	CHIP C 470PF K		
C312			CK73FB1E104K	CHIP C 0.10UF K		
C313			CE04NWOJ221M	ELECTRO 220UF 6.3WV		
C314			CK73GB1H471K	CHIP C 470PF K		
C315-317			CC73GSL1H101J	CHIP C 100PF J		
C318			CK73GB1H471K	CHIP C 470PF K		

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TH-27E : T,E,E2

⚠ indicates safety critical components.

PARTS LIST

× New Parts

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Teile ohne Parts No. werden nicht geliefert.

TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C320			CK73GB1H471K	CHIP C 470PF K		
C321			CK73FB1E104K	CHIP C 0.10UF K		
C322			CK73GB1H103K	CHIP C 0.01UF K		
C323			C92-0004-05	CHIP-TAN 1.0UF 10WV		
C325			CK73GB1H471K	CHIP C 470PF K		
C326			CK73GB1H103K	CHIP C 0.01UF K		
C328			CK73GB1H471K	CHIP C 470PF K		
C329, 330			CC73GCH1H221J	CHIP C 220PF J		
C331			CK73GB1H103K	CHIP C 0.01UF K		
C332-334			CK73GB1H471K	CHIP C 470PF K		
C335, 336			CC73GCH1H150J	CHIP C 15PF J		
C337			CK73GB1H471K	CHIP C 470PF K		
C338			CK73GB1H103K	CHIP C 0.01UF K		
C3340			CK73GB1H471K	CHIP C 470PF K		
TC1			C05-0371-05	TRIM CAP 10PF		
102	2D	*	E23-0603-05	GND TERMINAL (ANT)		
103	2B	*	E29-0490-24	GND TERMINAL (POWER MODULE)		
CN201		*	E29-0492-04	CONNECTOR (LCD)		
CN401		*	E40-5441-05	CONNECTOR (30P)		
		*	E40-5180-05	PIN CONNECTOR (3P)		
J1			E03-0170-05	DC JACK		
J2		*	E11-0443-05	PHONE JACK (MIC)		
J3		*	E11-0444-05	PHONE JACK (SP)		
W301		*	E37-0030-05	CONNECTING WIRE	KP	
105	1C	*	J21-4321-04	MOUNTING HARDWARE(VOL/ENC)		
106	3B	*	J21-4323-04	MOUNTING HARDWARE(LCD)		
		*	J39-0444-04	SPACER (POWER MODULE)		
CD201			L79-1013-05	DISCRIMINATOR		
CF201			L72-0362-05	CERAMIC FILTER		
L1 -4		*	L92-0131-05	FERRITE CHIP COIL		
L5			L40-1092-19	SMALL FIXED INDUCTOR(1U)		
L6 ,7			L40-1092-48	SMALL FIXED INDUCTOR(1U)		
L8		*	L92-0131-05	FERRITE CHIP COIL		
L9		*	L34-1187-25	COIL (8T)		
L10		*	L34-1272-15	COIL (3.5TS)		
L11			L34-1271-15	COIL (8.5T)		
L12			L40-1092-17	SMALL FIXED INDUCTOR(1U)		
L13		*	L34-1326-05	COIL (5.5T)		
L14			L40-5672-48	SMALL FIXED INDUCTOR(56n)		
L17		*	L34-4247-05	COIL		
L18			L40-3982-48	SMALL FIXED INDUCTOR(0.39U)		
L19		*	L34-4248-05	COIL		
L20		*	L34-4249-05	COIL		
L23			L33-0680-05	CHOKE COIL		
L201			L40-8282-48	SMALL FIXED INDUCTOR(0.82U)		
L202			L40-1092-81	SMALL FIXED INDUCTOR(1U)		
L203, 204		*	L92-0131-05	FERRITE CHIP COIL		
L301, 302		*	L92-0131-05	FERRITE CHIP COIL		
L303		*	L33-0737-05	SMALL FIXD INDUCTOR(1m)		
X1		*	L77-1440-05	CRYSTAL RESONATOR(12.8MHz)		
X301			L77-1398-05	CRYSTAL RESONATOR(3.58MHz)		
X302			L78-0052-05	CERAMIC RESONATOR(800KHz)		
X303		*	L77-1441-05	CRYSTAL RESONATOR(32KHz)		

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PARTS LIST

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TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
CP1			R90-0714-05	MULTI-COMP 10KX4		
CP301		*	R90-0718-05	MULTI-COMP 4.7KX4		
R1			R92-1252-05	CHIP R 0 OHM		
R2 ,3			RK73GB1J563J	CHIP R 56K J 1/16W		
R4			RK73GB1J821J	CHIP R 820 J 1/16W		
R5			RK73GB1J823J	CHIP R 82K J 1/16W		
R6 -9			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R10			RK73GB1J103J	CHIP R 10K J 1/16W		
R11			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R12			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R13			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R15 -17			R92-1252-05	CHIP R 0 OHM		
R18			RK73GB1J271J	CHIP R 270 J 1/16W		
R19 ,20			R92-1252-05	CHIP R 0 OHM		
R21			RK73GB1J271J	CHIP R 270 J 1/16W		
R22 ,23			R92-1252-05	CHIP R 0 OHM		
R24			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R26			RK73GB1J271J	CHIP R 270 J 1/16W		
R28			RK73GB1J271J	CHIP R 270 J 1/16W		
R29 ,30			R92-1252-05	CHIP R 0 OHM		
R31			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R32			RK73GB1J473J	CHIP R 47K J 1/16W		
R33			RK73FB2A101J	CHIP R 100 J 1/10W		
R34			RK73GB1J221J	CHIP R 220 J 1/16W		
R35			RK73GB1J153J	CHIP R 15K J 1/16W		
R36			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R37			RK73GB1J471J	CHIP R 470 J 1/16W		
R39			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R40			RK73GB1J471J	CHIP R 470 J 1/16W		
R41			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R42			RK73GB1J103J	CHIP R 10K J 1/16W		
R43			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R44			RK73GB1J104J	CHIP R 100K J 1/16W		
R45			RK73GB1J470J	CHIP R 47 J 1/16W		
R46			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R47			RK73GB1J104J	CHIP R 100K J 1/16W		
R48			RK73GB1J101J	CHIP R 100 J 1/16W		
R49			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R50			RK73GB1J104J	CHIP R 100K J 1/16W		
R51			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R52 -56			R92-1252-05	CHIP R 0 OHM		
R57			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R201			RK73GB1J330J	CHIP R 33 J 1/16W		
R202			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R204			RK73GB1J103J	CHIP R 10K J 1/16W		
R205			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R207			RK73GB1J473J	CHIP R 47K J 1/16W		
R208			R92-1252-05	CHIP R 0 OHM		
R209			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R210			R92-1252-05	CHIP R 0 OHM		
R211			RK73GB1J473J	CHIP R 47K J 1/16W		
R212			RK73GB1J823J	CHIP R 82K J 1/16W		
R213			RK73GB1J104J	CHIP R 100K J 1/16W		
R214			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R215			RK73GB1J681J	CHIP R 681 J 1/16W		

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TH-27E : T,E,E2

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TH-27A/E

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TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description. 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
R216			RK73GB1J332J	CHIP R 3.3K J 1/16W	KP KP	
R217			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R218			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R219			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R220			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R221			RK73GB1J154J	CHIP R 150K J 1/16W		
R222			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R223			RK73GB1J223J	CHIP R 22K J 1/16W		
R224			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R225			RK73GB1J103J	CHIP R 10K J 1/16W		
R226			RK73GB1J224J	CHIP R 220K J 1/16W		
R227			RK73GB1J153J	CHIP R 15K J 1/16W		
R228			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R229			RK73GB1J103J	CHIP R 10K J 1/16W		
R230			RK73GB1J100J	CHIP R 10 J 1/16W		
R231			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R232			RK73GB1J274J	CHIP R 270K J 1/16W		
R233			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R234, 235			RK73GB1J124J	CHIP R 120K J 1/16W		
R236			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R237			R92-1252-05	CHIP R 0 ΩHM		
R238			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R239			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R240			RK73GB1J274J	CHIP R 270K J 1/16W		
R241			RK73GB1J104J	CHIP R 100K J 1/16W		
R242			RK73GB1J100J	CHIP R 10 J 1/16W		
R243			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R244			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R245			RK73GB1J103J	CHIP R 10K J 1/16W		
R246			RK73GB1J391J	CHIP R 390 J 1/16W		
R247			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R248			RK73GB1J223J	CHIP R 22K J 1/16W		
R249			RK73GB1J273J	CHIP R 27K J 1/16W		
R250			RK73GB1J154J	CHIP R 150K J 1/16W		
R251, 252			RK73GB1J104J	CHIP R 100K J 1/16W		
R253			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R254			R92-1252-05	CHIP R 0 ΩHM		
R255			RK73GB1J822J	CHIP R 8.2K J 1/16W		
R256, 257			RK73GB1J473J	CHIP R 47K J 1/16W		
R258			RK73GB1J104J	CHIP R 100K J 1/16W		
R259			RK73GB1J103J	CHIP R 10K J 1/16W		
R301			RK73GB1J153J	CHIP R 15K J 1/16W		
R302			RK73GB1J473J	CHIP R 47K J 1/16W		
R303			RK73GB1J563J	CHIP R 56K J 1/16W		
R304			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R305			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R306			RK73GB1J473J	CHIP R 47K J 1/16W		
R308			RK73GB1J471J	CHIP R 470 J 1/16W		
R309			RK73GB1J474J	CHIP R 470K J 1/16W		
R310			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R311-313			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R314		*	RK73GB1J124G	CHIP R 120K G 1/16W		
R315		*	RK73GB1J274G	CHIP R 270K G 1/16W		
R316			RK73GB1J473J	CHIP R 47K J 1/16W		
R317			RK73FB2A100J	CHIP R 10 J 1/10W		

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PARTS LIST

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TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R318			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R319			R92-1252-05	CHIP R 0 0HM		
R320			RK73GB1J333J	CHIP R 33K J 1/16W		
R323			RK73GB1J473J	CHIP R 47K J 1/16W		
R324			RK73GB1J274J	CHIP R 270K J 1/16W		
R325-327			RK73GB1J223J	CHIP R 22K J 1/16W		
R328			RK73GB1J473J	CHIP R 47K J 1/16W		
R329			RK73GB1J224J	CHIP R 220K J 1/16W		
R330			RK73GB1J100J	CHIP R 10 J 1/16W		
R331			RK73FB2A100J	CHIP R 10 J 1/10W		
R332			RK73GB1J473J	CHIP R 47K J 1/16W		
R333			RK73GB1J104J	CHIP R 100K J 1/16W		
R334			R92-1252-05	CHIP R 0 0HM		KP
R335			R92-1252-05	CHIP R 0 0HM		TE
R336			RK73GB1J473J	CHIP R 47K J 1/16W		
R337			R92-1252-05	CHIP R 0 0HM		KP
R338			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R339, 340			RK73GB1J473J	CHIP R 47K J 1/16W		
R341			RK73GB1J331J	CHIP R 330 J 1/16W		
R342			RK73GB1J105J	CHIP R 1.0M J 1/16W		
R343			RK73GB1J470J	CHIP R 47 J 1/16W		
R344			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R345			RK73GB1J473J	CHIP R 47K J 1/16W		
R347			RK73GB1J223J	CHIP R 22K J 1/16W		
R348			RK73GB1J270J	CHIP R 27 J 1/16W		
R349			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R350-352			RK73GB1J103J	CHIP R 10K J 1/16W		
R353, 354			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R355, 356			RK73GB1J473J	CHIP R 47K J 1/16W		
R360			RD14CB2C183J	RD 18K J 1/6W		PMXE
R361, 362			R92-1252-05	CHIP R 0 0HM		
R363			RK73GB1J473J	CHIP R 47K J 1/16W		
R401			RK73FB2A100J	CHIP R 10 J 1/10W		
R402			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R403, 404			R92-1218-05	CHIP R 0.1 J 1/2W		
VR201		*	R23-3406-05	POTENTIOMETER (AF/SQ)		
VR202		*	R12-6708-05	TRIMMING POT.1.5K (SMETER)		
VR203		*	R12-6705-05	TRIMMING POT.470 0HM (HI POW)		
VR204		*	R12-6703-05	TRIMMING POT.220 0HM (MID POW)		
VR205		*	R12-6705-05	TRIMMING POT.470 0HM (LO POW)		
VR206, 207		*	R12-6717-05	TRIMMING POT.47K (DTMF, MIC)		
S301, 302			S40-1117-05	TACT SWITCH		
108	2B		T91-0502-05	MICROPHONE		
D1 ,2			MA77	DIODE		
D3			1SV172	DIODE		
D4			M1808	DIODE		
D5 -7			1SS312	DIODE		
D8 -10			MA360	DIODE		
D11			HSM88AS	DIODE		
D12			MA110	DIODE		
D201		*	DAN222	DIODE		
D202		*	MA8039	DIODE		
D203		*	MA728	DIODE		KP

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TX-RX UNIT (X57-364X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
D204			MA110	DIODE		
D301			DAN202U	DIODE		
D303		*	DA221	DIODE		
D304		*	MA728	DIODE		
D305		*	DA221	DIODE		
D401, 402		*	DE5SC4M	DIODE		
D401, 402		*	EA40QC5F	DIODE		
D403			MA110	DIODE		
D404		*	RD22P	DIODE		
D406			1SS302	DIODE		
IC1		*	M56760FP	IC(PLL)		
IC3		*	S-AV22A	POWER MODULE		
IC201		*	MC3372D	IC		
IC202			LM301AD	IC(OP AMP)		
IC203			NJM4560M	IC(OP AMP X2)		
IC301		*	SC17710YBA*J	IC(5V REG)		
IC302			S-8054ALR-LN	IC(RESET)		
IC303		*	75112GF-596-3BE	MPU	KPMXE	
IC304			LC7385M	IC(DTMF RECEIVER)		
IC305		*	HD404608A80H	MPU		
Q1		*	2SC4617(R)	TRANSISTOR		
Q2			2SC4083(N,P)	TRANSISTOR		
Q3		*	DTC143ZU	DIGITAL TRANSISTOR		
Q4		*	DTA143XE	DIGITAL TRANSISTOR	KP	
Q7			2SC4083(N,P)	TRANSISTOR		
Q8			2SK360(E)	FET		
Q201		*	2SC4617(R)	TRANSISTOR		
Q202		*	DTC124EE	DIGITAL TRANSISTOR		
Q203, 204		*	DTA144EE	DIGITAL TRANSISTOR		
Q205, 206			PMC3	DIGITAL TRANSISTOR		
Q207			2SK879(Y)	FET		
Q208, 209			DTC114YE	DIGITAL TRANSISTOR		
Q210			DTA114YE	DIGITAL TRANSISTOR	KP	
Q211, 212			DTA114YE	DIGITAL TRANSISTOR		
Q213			DTB113ZK	DIGITAL TRANSISTOR		
Q301			2SC4116(Y)	TRANSISTOR		
Q302			DTA143XU	DIGITAL TRANSISTOR	KP	
Q303			DTA114YU	DIGITAL TRANSISTOR		
Q305			2SB798(DL,DK)	TRANSISTOR		
Q306		*	DTC144EE	DIGITAL TRANSISTOR		
Q401			2SB798(DL,DK)	TRANSISTOR		
S201			W02-0900-15	ENCODER		
A1		*	X58-3740-00	(VCO)		
A2		*	X58-3750-00(A)	(NOISE)	KP	
A2		*	X58-3750-00(B)	(E-LOW)	KP	
A2		*	X58-3750-00(C)	(DRIVE)	KP	
A2		*	X58-3750-00(D)	(MCF)	KP	
A2		*	X58-3750-00(E)	(AM)	KP	
A2		*	X58-3750-00(F)	(AF/AVR)	KP	
A2		*	X58-3750-11(A)	(NOISE)	MXTE	
A2		*	X58-3750-11(B)	(E-LOW)	MXTE	
A2		*	X58-3750-11(C)	(DRIVE)	MXTE	
A2		*	X58-3750-11(D)	(MCF)	MXTE	

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TX-RX UNIT (X57-364X-XX)

A1 : SUB UNIT VCO (X58-3740-00)

A2 : SUB UNIT (X58-3750-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
A2		*	X58-3750-11(F)	(AF/AVR)	MXTE	
A1 : SUB UNIT VCO (X58-3740-00)						
C1			CC73GUJ1H010C	CHIP C 1PF		
C2			CK73GB1H332K	CHIP C 3300PF K		
C3			CC73GCH1H050C	CHIP C 5PF C		
C4			CC73GCH1H030C	CHIP C 3PF C		
C5			CC73GCH1H010C	CHIP C 1PF C		
C6		*	CK73GR1C333KMU	CHIP C 0.033UF K		
C7			CK73GB1H102K	CHIP C 1000PF K		
C8 ,9			CC73GCH1H100D	CHIP C 10PF D		
C10 -12			CK73GB1H102K	CHIP C 1000PF K		
C13			CK73FB1E223K	CHIP C 0.022UF K		
L1			L40-1092-19	SMALL FIXED INDUCTOR 1U		
L2		*	L34-1333-05	COIL 8.5T		
L3		*	L34-1331-05	COIL 5.5T		
L4			L40-1092-48	SMALL FIXED INDUCTOR 1U		
R1			RK73GB1J104J	CHIP R 100K J 1/16W		
R2			RK73GB1J473J	CHIP R 47K J 1/16W		
R3			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R4			RK73GB1J561J	CHIP R 560 J 1/16W		
R5			RK73GB1J151J	CHIP R 150 J 1/16W		
R6			RK73GB1J470J	CHIP R 47 J 1/16W		
R7			RK73GB1J823J	CHIP R 82K J 1/16W		
R8			RK73GB1J821J	CHIP R 820 J 1/16W		
R9			RK73GB1J823J	CHIP R 82K J 1/16W		
R10			RK73GB1J821J	CHIP R 820 J 1/16W		
D1 ,2			MA333	DIODE		
D3			MA360	DIODE		
D4			MA77	DIODE		
Q1			DTC144EU	DIGITAL TRANSISTOR		
Q2			2SK238(K17)	FET		
Q3 ,4			2SC4083(N,P)	TRANSISTOR		
A2 : SUB UNIT (X58-3750-XX) -00 : K,P -11 : M,M2,X,T,E,E2						
C1			CK73GB1H102K	CHIP C 1000PF K		
C3			CK73FB1E223K	CHIP C 0.022UF K		
C4 ,5			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C11 -13			CK73GB1H102K	CHIP C 1000PF K		
C21 ,22			CK73GB1H102K	CHIP C 1000PF K		
C23			CC73GCH1H100D	CHIP C 10PF D		
C24 -26			CK73GB1H102K	CHIP C 1000PF K		
C27			CC73GCH1H150J	CHIP C 15PF J		
C42			CC73GCH1H080D	CHIP C 8PF D		
C43			CK73GB1H102K	CHIP C 1000PF K		
C51			CC73GCH1H101J	CHIP C 100PF J	KP	
C52			CK73FB1E223K	CHIP C 0.022UF K	KP	
C53			CK73FB1E333K	CHIP C 0.033UF K	KP	
C54			C90-0004-04	CHIP TAN 1.0UF 10WV	KP	
C57			CK73GB1H103K	CHIP C 0.01UF K	KP	
C58			C92-0509-05	TANTAL 10UF 6.3WV	KP	
C59			CK73GB1H103K	CHIP C 0.01UF K	KP	
C60			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	KP	
C71			C92-0047-05	ELECTRO 47UF 6.3WV		
C72			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		

E: Scandinavia & Europe K: USA P: Canada W: Europe

U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

TH-27A : K,P,M,N2,X

TH-27E : T,E,E2

⚠ indicates safety critical components.

PARTS LIST

※ New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

A2 : SUB UNIT (X58-3750-XX)


Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C73 C74 C75 -81 C82 C83			CK73GB1H102K C92-0047-05 CK73GB1H102K C92-0038-05 C92-0004-05	CHIP C 1000PF K ELECTRØ 47UF 6.3WV CHIP C 1000PF K ELECTRØ 22UF 16WV CHIP-TAN 1.0UF 10WV		
C55,56			CK73FB1E104K J30-0545-05	CHIP C 0.10UF K SPACER	KP	
L21 ,22 X41 XF41		*	L40-1081-80 L77-1438-05 * L71-0409-05	SMALL FIXED INDUCTØR CRYSTAL RESONATOR(45.505MHz) CRYSTAL FILTER (45.05MHz)		
R1 R2 R3 R4 R5			RK73GB1J274J RK73GB1J561J RK73GB1J332J RK73GB1J101J RK73GB1J152J	CHIP R 270K J 1/16W CHIP R 560 J 1/16W CHIP R 3.3K J 1/16W CHIP R 100 J 1/16W CHIP R 1.5K J 1/16W		
R6 R7 R11 R12 R13			RK73GB1J103J RK73GB1J183J RK73GB1J152J RK73GB1J472J RK73GB1J182J	CHIP R 10K J 1/16W CHIP R 18K J 1/16W CHIP R 1.5K J 1/16W CHIP R 4.7K J 1/16W CHIP R 1.8K J 1/16W		
R21 R22 R23 R24 R25			RK73GB1J152J RK73GB1J562J RK73GB1J181J RK73GB1J390J RK73GB1J102J	CHIP R 1.5K J 1/16W CHIP R 5.6K J 1/16W CHIP R 180 J 1/16W CHIP R 39 J 1/16W CHIP R 1.0K J 1/16W		
R26 R27 R28 R29 R30			RK73GB1J471J RK73GB1J103J RK73GB1J220J RK73GB1J470J RK73GB1J331J	CHIP R 470 J 1/16W CHIP R 10K J 1/16W CHIP R 22 J 1/16W CHIP R 47 J 1/16W CHIP R 330 J 1/16W		
R31 R41 R42 R43 R51			RK73GB1J561J RK73GB1J681J RK73GB1J334J RK73GB1J103J R90-1252-05	CHIP R 560 J 1/16W CHIP R 681 J 1/16W CHIP R 330K J 1/16W CHIP R 10K J 1/16W CHIP R 0 ØHM J 1/16W	KP	
R52 R53 R54 R55 R56			RK73GB1J102J RK73GB1J274J RK73GB1J102J RK73GB1J391J RK73GB1J101J	CHIP R 1.0K J 1/16W CHIP R 270K J 1/16W CHIP R 1.0K J 1/16W CHIP R 390 J 1/16W CHIP R 100 J 1/16W	KP KP KP KP KP	
R71 R72 R73 R74 R75			RK73GB1J153J RK73GB1J273J RK73GB1J121J RK73GB1J272J RK73GB1J182J	CHIP R 15K J 1/16W CHIP R 27K J 1/16W CHIP R 120 J 1/16W CHIP R 2.7K J 1/16W CHIP R 1.8K J 1/16W		
R76 R77 R78			RK73GB1J472J RK73GB1J332J RK73GB1J102J	CHIP R 4.7K J 1/16W CHIP R 3.3K J 1/16W CHIP R 1.0K J 1/16W		
D1 D2 D21 D22 D71		*	HSM88AS DA221 MA77 * DA221 * DAN222	DIODE DIODE DIODE DIODE DIODE		

E: Scandinavia & Europe K: USA P: Canada W: Europe

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TH-27A : K,P,M,M2,X
TH-27E : T,E,E2

 indicates safety critical components.

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

A2 : SUB UNIT (X58-3750-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
D72 ,73 IC51 IC71 Q1 Q2		*	DA221 TA7787AF NJM386BM	DIODE IC(FM/AM IF/3V) IC(OP AMP)	KP	
		*	2SC4617(R) DTC114YE	TRANSISTOR DIGITAL TRANSISTOR		
Q3 Q11 ,12 Q13 Q14 Q15		*	DTC144EE DTC114YU FMC5	DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR		
		*	DTA123EU DTC114YU	DIGITAL TRANSISTOR DIGITAL TRANSISTOR		
Q21 Q22 Q41 Q51 Q52			2SC4083(N,P) 2SC4093 2SC4215(Y)	TRANSISTOR TRANSISTOR TRANSISTOR		
		*	2SC4617(R)	TRANSISTOR	KP	
		*	DTC144EE	DIGITAL TRANSISTOR	KP	
Q53 Q71 Q72 Q73 Q74		*	2SC4617(R) 2SB798(DL,DK)	TRANSISTOR TRANSISTOR	KP	
		*	2SC4617(R)	TRANSISTOR		
		*	2SB1182(Q)	TRANSISTOR		
		*	UMW1	DIGITAL TRANSISTOR		

E: Scandinavia & Europe K: USA P: Canada W: Europe

U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

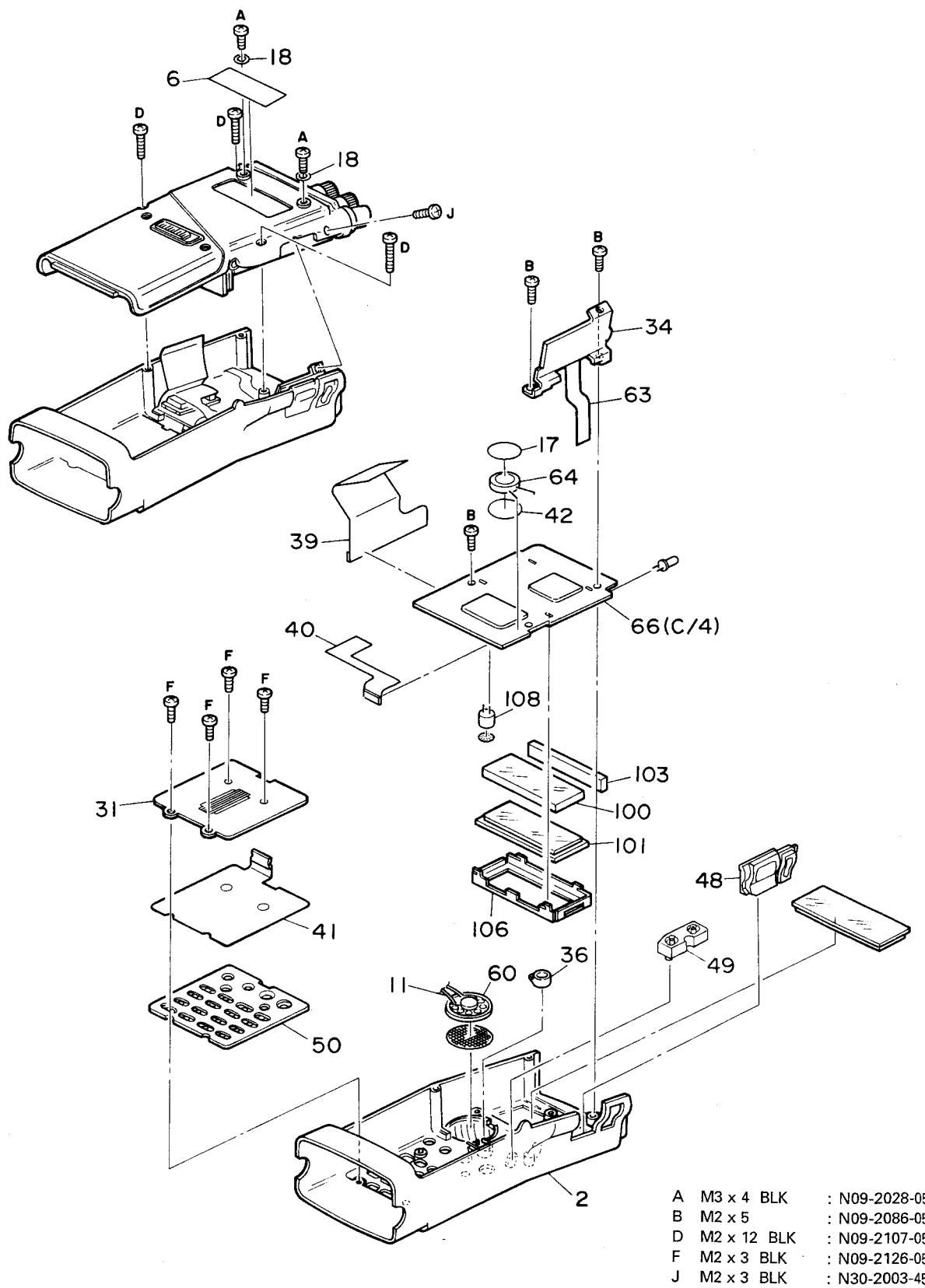
TH-27A : K,P,M,M,X

TH-27E : T,E,E2

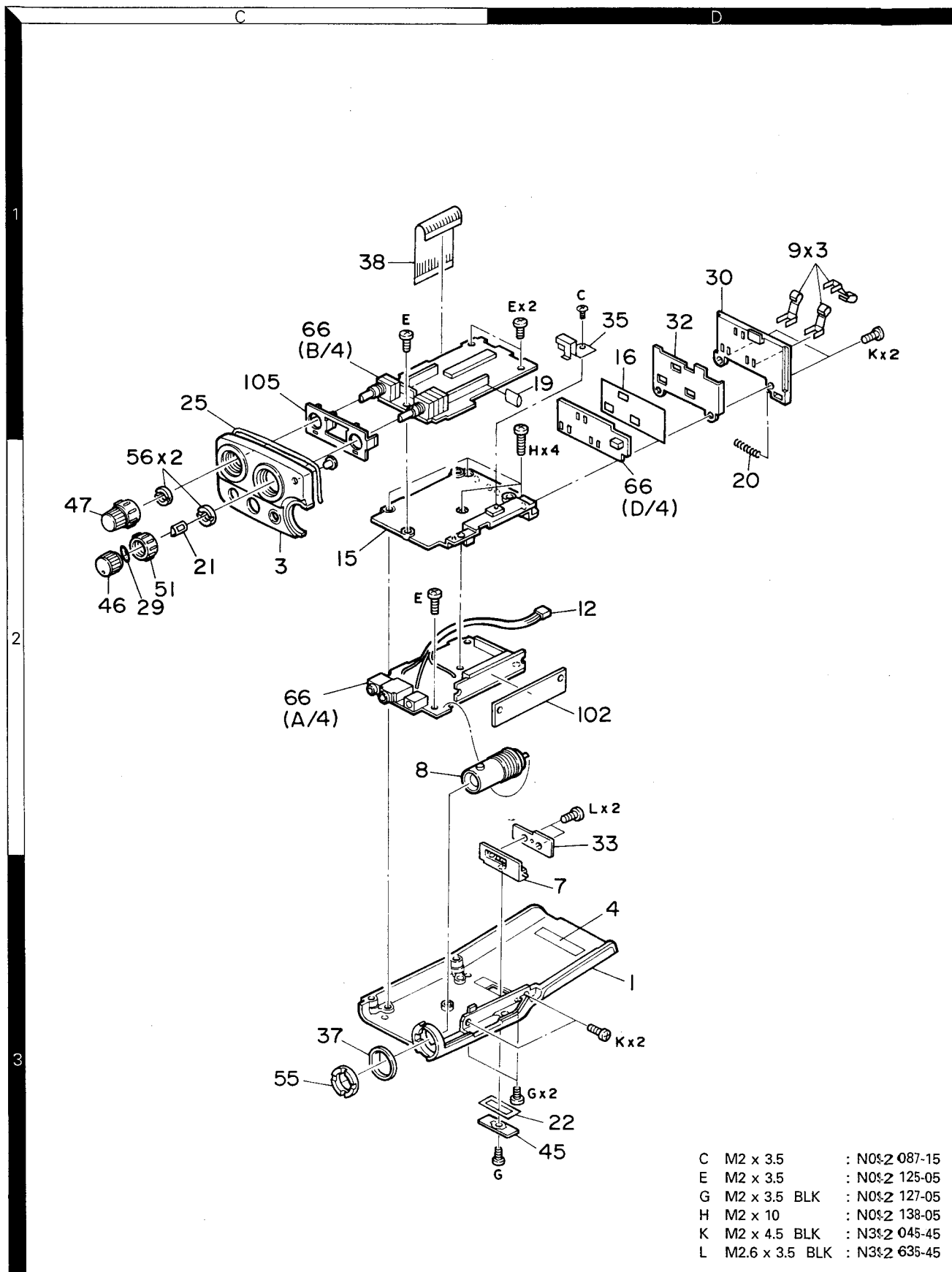
⚠ indicates safety critical components

TH-27A/E

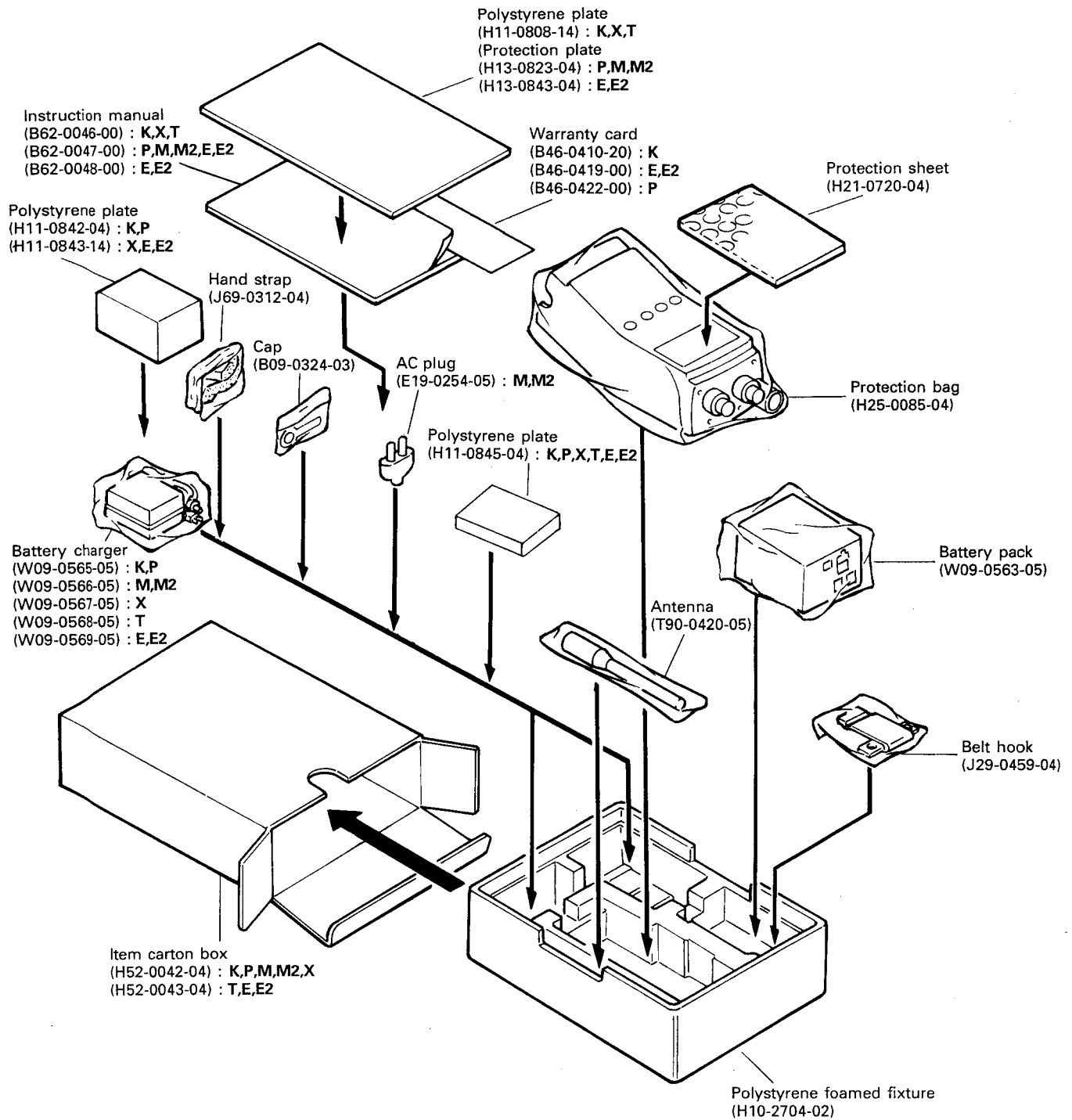
EXPLODED VIEW



EXPLODED VIEW



PACKING



CAUTION

Mounting Power Module

Replace the power module as follows.

When removing the power module from the box, take care not to bend the ground terminal, otherwise, the power module cannot be used.

1. Put the spacer (the one from the defective power module can be used) on the power module and put the power module on the RF unit.
2. Attach (but do not fix) the ground terminal and place the power unit in the jig case. (Figure 1)

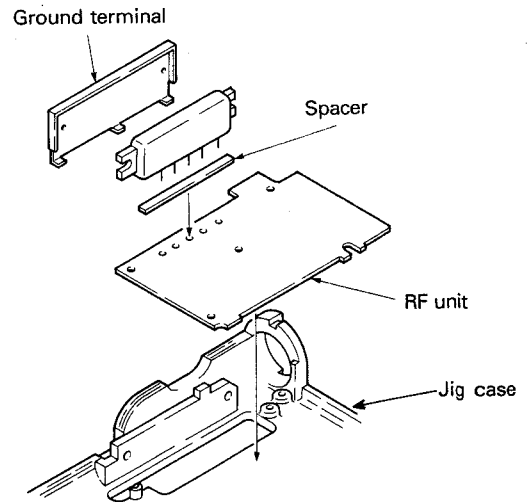


Fig. 1

3. Cover the power module with the shield cover from the old module and tighten the two side screws firmly, pressing the cover lightly in the direction of the arrow. (You can use the old screws.) (Figure 2)

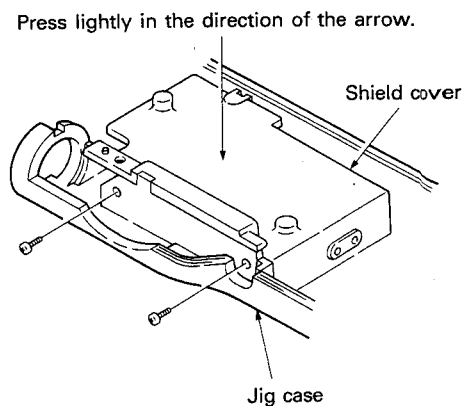


Fig. 2

4. Turn the jig case over and solder the ground terminal and the pins in the square holes. Do not spread the solder over the surface where the ground terminal touches the rear case. (Figure 3)
Cut the power module leads so they project less than 1.5mm.
5. Remove the two screws and take the RF unit out of the jig case. Mount the RF unit on the rear case of the repaired transceiver and tighten the two screws (in the Figure), pressing the shield cover lightly in the direction of shown in Figure 2.
Do not fix other screws before tightening the two screws mentioned above.

Note : Do not knock the power module and make it go askew.

Do not apply silicone compound.

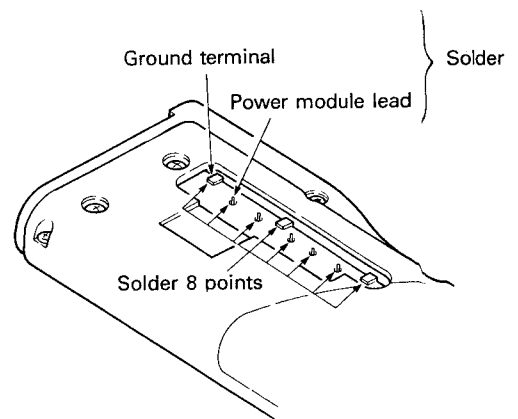


Fig. 3

ADJUSTMENT

Required Test Equipment

1. Stabilized Power Supply

- 1) The supply voltage can be changed between 5V and 18V, and the current is 5A or more.
- 2) The standard voltage is 13.8V.

2. DC Ammeter

- 1) Class 1 ammeter (17 ranges and other features).
- 2) The full scale can be set to either 300mA or 3A.
- 3) A cable of less internal loss must be used.

3. Frequency Counter (f. counter)

- 1) Frequencies of up to 1GHz or so can be measured.
- 2) The sensitivity can be changed to 250MHz or below, and measurements are highly stable and accurate (0.2ppm or so).

4. Power Meter

- 1) Measurable frequency : Up to 500MHz.
- 2) Impedance : 50Ω , unbalanced.
- 3) Measuring range : Full scale of 10W or so.
- 4) A standard cable (5D2W 1m) must be used.

5. RF VTVM (RF V.M)

- 1) Measurable frequency : Up to 500MHz or so.

6. Linear Detector

- 1) Measurable frequency : Up to 500MHz.
- 2) Characteristics are flat, and CN is 60dB or more.

7. Digital Voltmeter

- 1) Voltage range : FS = 18V or so.
- 2) Input resistance : $1M\Omega$ or more.

8. Oscilloscope

- 1) Measuring range : DC to 30MHz.
- 2) Provides highly accurate measurements for 5 to 25MHz.

9. AF Voltmeter (AF V.M)

- 1) Measurable frequency : 50Hz to 1MHz.
- 2) Maximum sensitivity : 1mV or more.

10. Spectrum Analyzer

- 1) Measuring range : DC to 1GHz or more.

11. Standard Signal Generator (SSG)

- 1) Maximum frequency : 500MHz or more.
- 2) Output : -20dB/0.1 μ V to 120dB/1V.
- 3) Output impedance : 50Ω

12. Tracking Generator

- 1) Center frequency : 50kHz to 500MHz.
- 2) Frequency deviation : ± 35 MHz.
- 3) Output voltage : 100mV or more.

13. Dummy Load

- 1) 8Ω , 3W or more.

14. Distortion Meter

- 1) Measurable frequency : 30Hz to 100kHz.
- 2) Input level : 50mV to 10Vrms.

ADJUSTMENT

TX-RX Common Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Reset	1) POWER SW : OFF Hold down "M" key POWER SW : ON							
2. Voltage check	1) Power supply voltage : 13.8V							

PLL Adjustment

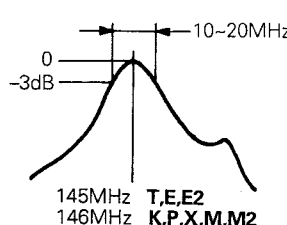
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Reference frequency	1) Frequency : 144.00MHz PTT : ON	F. counter	RF	ANT	RF	TC1	144.00MHz	±150Hz

TX Adjustment

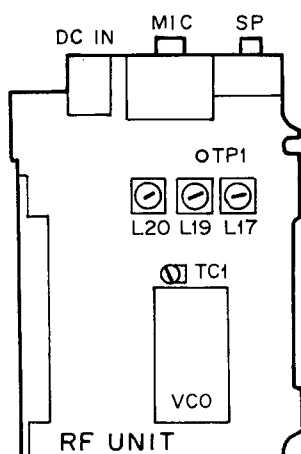
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Power adjustment	1) Frequency : 146.05MHz K,P,X,M,M2 Frequency : 145.05MHz T,E,E2 Power : Low PTT : ON	Power meter	RF (A/4)	ANT	IF (B/4)	VR205	MAX	6W or more
	2) Power : Low PTT : ON					VR205	0.5W	±0.2W
	3) Power : Mid PTT : ON					VR204	2.5W	±0.5W
	4) Power : Hi PTT : ON					VR203	5.5W	±0.5W
	5) Power : E-Low PTT : ON						Check	Approx. 20mW
	6) DC input : 7.7V Power : Hi PTT : ON						Check	Approx. 2W
2. DEV	1) Frequency : 146.05MHz K,P,X,M,M2 Frequency : 145.05MHz T,E,E2 AG output : 1kHz, 40mV PTT : ON	Power meter AG Linear detector			IF (B/4)	VR207	4.3kHz	±100Hz
	2) AG output : 1kHz, 4mV PTT : ON						Check	2.5~3.5kHz
3. DTMF (1750Hz TONE)	1) Frequency : 146.05MHz K,P,X,M,M2 Frequency : 145.05MHz T,E,E2 PTT : ON "DTSS" and "8" key : Push				IF (B/4)	VR206	3kHz	±200Hz
4. CTCSS (K,P only)	1) Frequency : 146.05MHz TONE : ON PTT : ON				CTCSS	VR1	0.5kHz	0.5~1.25kHz

ADJUSTMENT

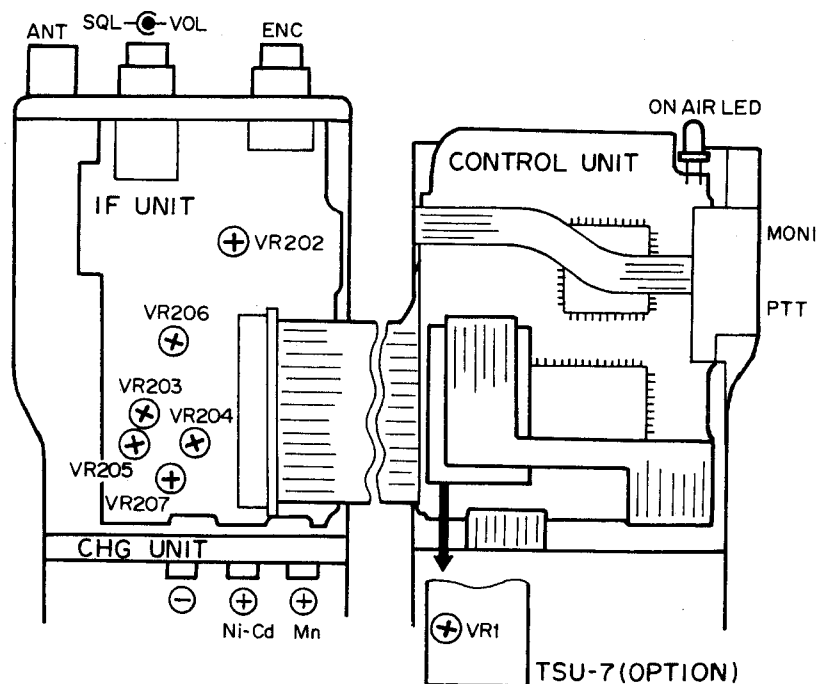
RX Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. BPF	1) Tracking generator Output : -40dBm Center : 146.00MHz K,P,X,M,M2 145.00MHz T,E,E2 Span : 200MHz Scale : 10dB/div	Tracking generator Spectrum analyzer	RF (A/4)	ANT TP1	RF (A/4)	L17 L19 L20	GAIN MAX 	
2. Receive sensitivity	1) Frequency : 146.05MHz K,P,X,M,M2 Frequency : 145.05MHz T,E,E2 SSG output : -15dBμV MOD : 1kHz DEV : ±3kHz	Oscilloscope SSG AF V.M Distortion meter	RF (A/4)	SP			Check	SINAD : 12dB or more
3. S-meter	1) Frequency : 146.05MHz K,P,X,M,M2 Frequency : 145.05MHz T,E,E2 SSG output : -12dBμV		CONT (C/4)	S-meter	IF (B/4)	VR202	The 1st digit is just turned on.	
	2) SSG output : 19dBμV						Check	All digits light.

Adjustment Points



L17,19,20 : BPF
TC1 : Reference frequency



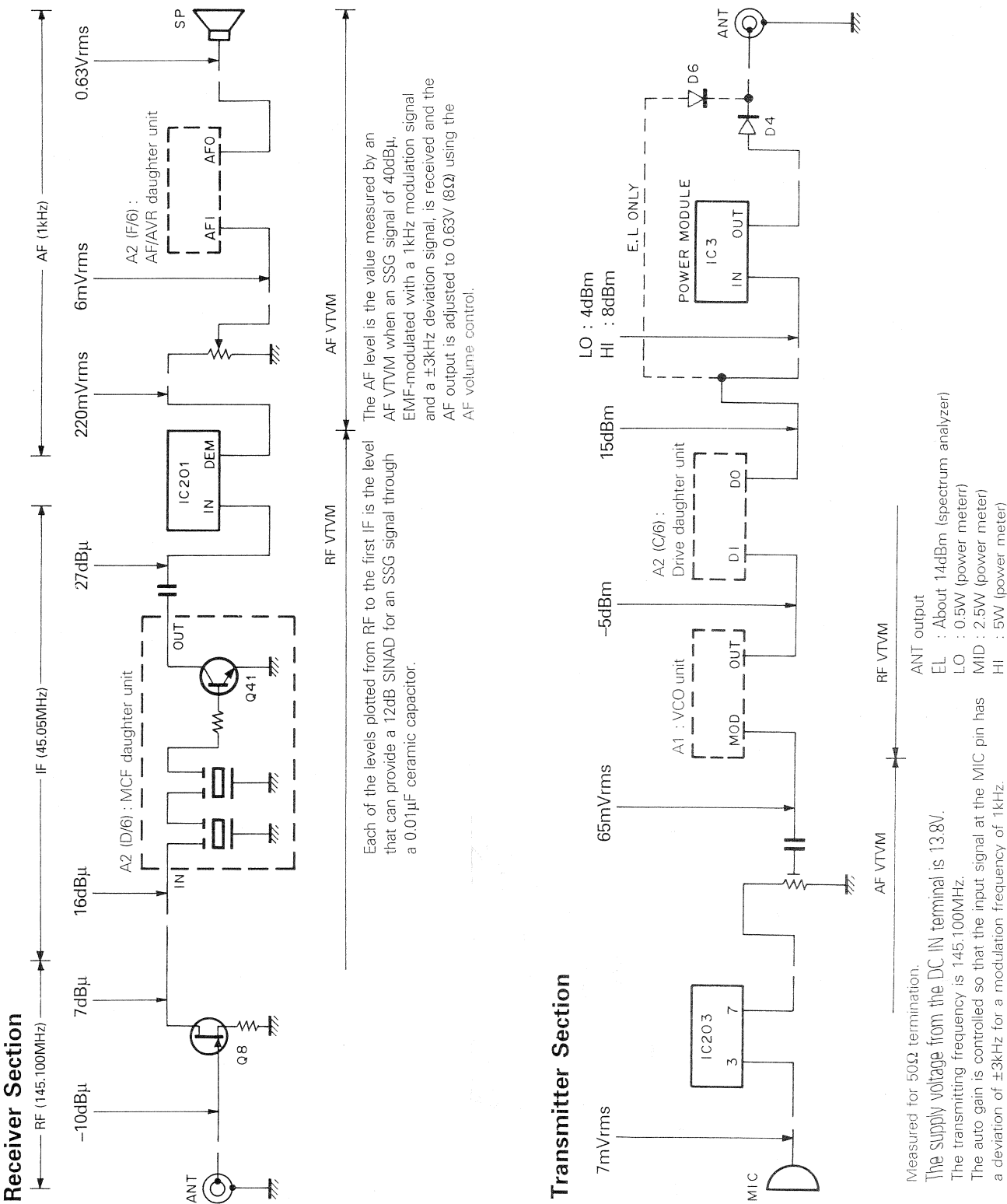
VR202 : S-meter
VR203 : Power HI
VR204 : Power MID
VR205 : Power LOW
VR206 : DTMF
VR207 : DEV

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
TX-RX UNIT (A/4) : RF ↔ TX-RX UNIT (B/4) : IF			
	1	I/O	IF signal line.
	2	B	Power supply.
	3	FBO	Final module B power supply.
	4	PTT	PTT switch control. "L" : TX, "H" : RX
	5	REM	Remote control microphone signal.
	6	AFO	Audio output line.
	7	SP	Signal line to internal speaker.
	8	MIC	Internal microphone signal line.
	9	IM	Signal line from microphone.
	10	5M	5V power supply for microphone.
	11	GND	Ground.
	12	5R	5V power supply for reception.
	13		
	14		
	15	UL	Unlock signal. "H" : Unlock
	16	DP	Serial data.
	17	CP	Clock signal.
	18	EP	PLL enable.
	19	5C	IF 5V power supply.
	20	MOD	Modulation input.
	21	EL	TX power switch. "L" : E-LOW
	22	APC	APC voltage input.
	23	5T	5V power supply for transmission.
TX-RX unit (B/4) : IF ↔ TX-RX UNIT (C/4) : CONTROL			
	1	B	B power supply.
	2	PTT	PTT switch control. "L" : TX, "H" : RX
	3	5M	5V power supply for microphone.
	4	DTMF/BEEP /1750	DTMF signal, BEEP signal. (A type) 1750 tone signal. (E type)
	5	SM	S-meter signal.
	6	REM	Remote control microphone signal.
	7	DN	Encoder down signal.
	8	UP	Encoder up signal.
	9	GND	Ground.
	10	KM	MIC mute data. "H" : Mute
	11	SP	Signal line to internal speaker.
	12	AE	Ground lines of internal speaker and microphone.
	13	MIC	Internal microphone signal line.
	14	TO	Tone signal.
	15	SAVE	SAVE data. "H" : SAVE, "L" : Normal
	16		
	17	5RSW	RX 5V control. "L" : ON

Connector No.	Terminal No.	Terminal Name	Terminal Function
	18	5RCSW	IF 5V control. "L" : ON
	19	5TSW	TX 5V control. "L" : ON
	20	AFC	AF amplifier power supply control. "L" : ON
	21	MUTE	Audio mute signal. "L" : Mute
	22	H/L2	Transmission power selection signal. "H" : Low, "L" : Mid, Hi
	23	H/L1	Transmission power selection signal. "L" : Low, Hi, "H" : Mid
	24	UL	Unlock signal. "H" : Unlock
	25	DP	Serial data.
	26	CP	Clock signal.
	27	EP	PLL enable.
	28	EL	TX power switch. "L" : E-LOW
	29	BUSY	BUSY signal. "H" : BUSY
	30	CI	Signaling AF output.
TX-RX UNIT (C/4) : CONTROL ↔ CTCSS UNIT			
	1	TO	Tone signal output.
	2	SDO	Tone signal coincidence discriminating signal. "L" : Coincides
	3	CP	Clock signal.
	4	DP	Tone serial data.
	5	ET	Tone enable.
	6	5C	5V power supply.
	7	RD	Signaling AF output.
	8	GND	Ground.
TX-RX UNIT (C/4) : CONTROL ↔ KEYBOARD FPC			
	1	R10	Key matrix output.
	2	R11	Key matrix output.
	3	R12	Key matrix output.
	4	R13	Key matrix output.
	5	R31	Key matrix input.
	6	R30	Key matrix input.
	7	R23	Key matrix input.
	8	R22	Key matrix input.
	9	R21	Key matrix input.
TX-RX UNIT (C/4) : CONTROL ↔ PTT FPC			
	1	GND	Ground.
	2	R20	Key matrix output. MONI switch
	3	R11	Key matrix input. MONI switch
	4	D11	PTT switch control. "L" : TX, "H" : RX

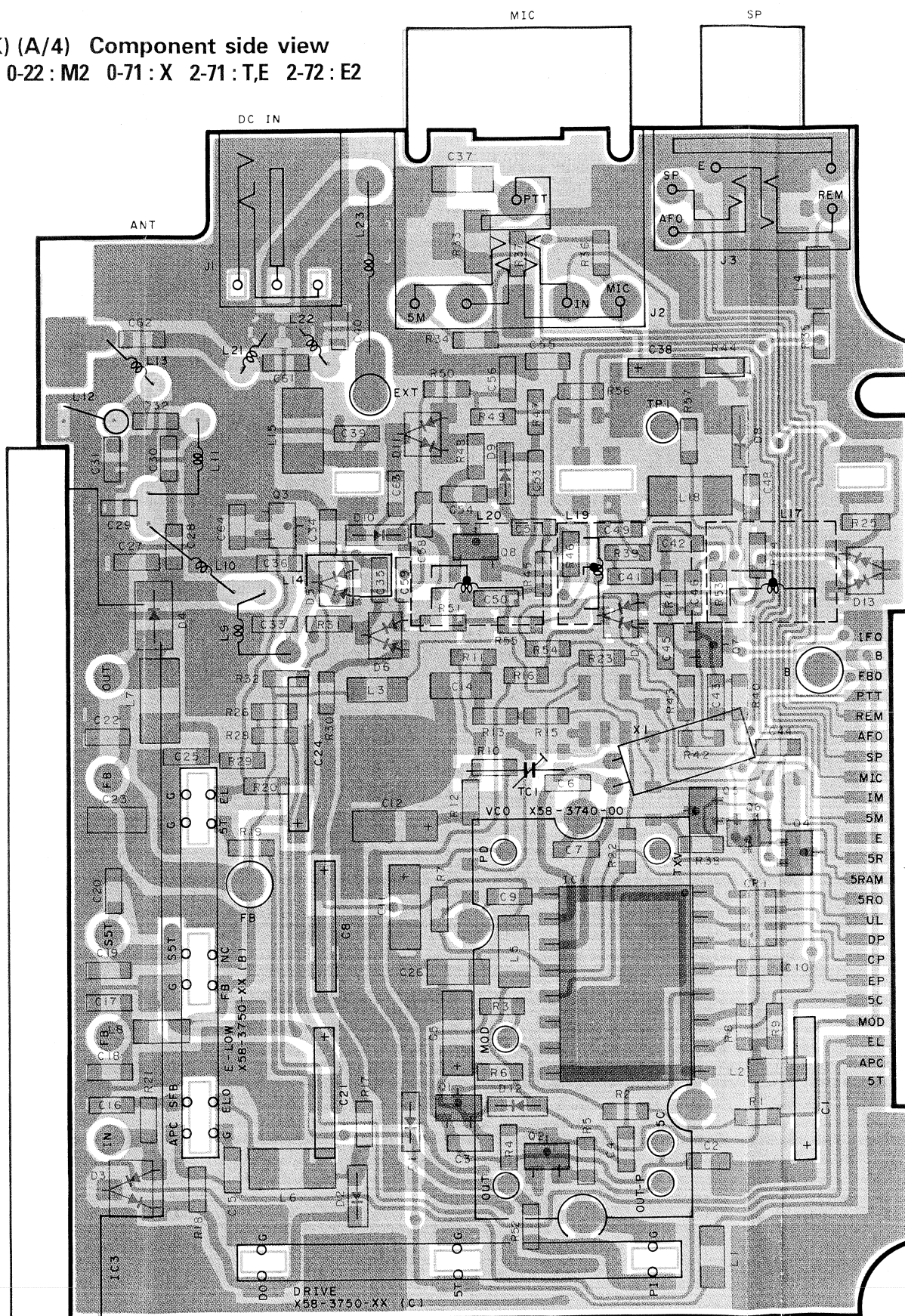
LEVEL DIAGRAM



TH-27A/E PC BOARD VIEWS

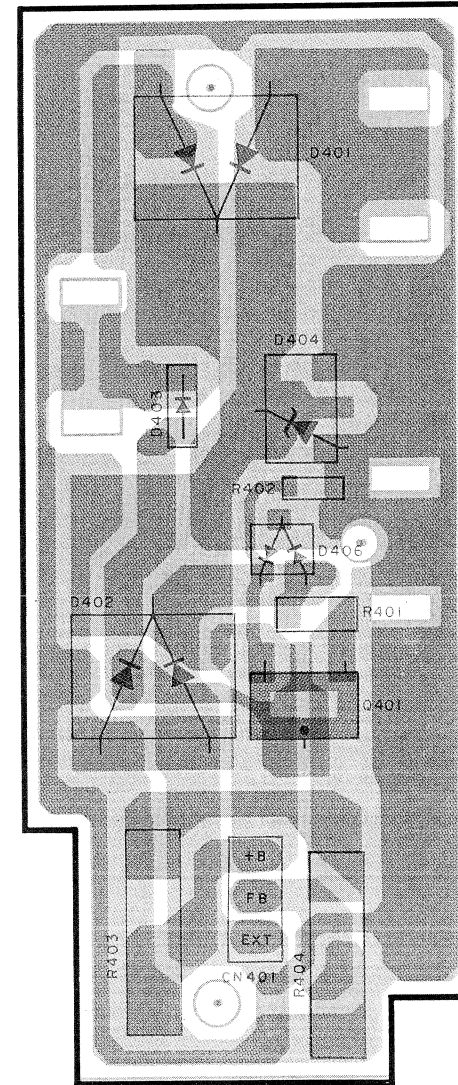
RF (X57-364X-XX) (A/4) Component side view
0-11:K,P 0-21:M 0-22:M2 0-71:X 2-71:T,E 2-72:E2

Q1 : 2SC4617(R) Q2,7 : 2SC4083(N,P) Q3 : DTC143ZU Q4,6 : DTA143XE Q5 : DTA144EE Q8 : 2SK360(E)
IC1 : M56760FP IC3 : S-AV22A
D1,2 : MA77 D3,13 : 1SV172 D4 : M1808 D5~7 : 1SS312 D8~10 : MA360 D11 : HSM88AS D12 : MA110

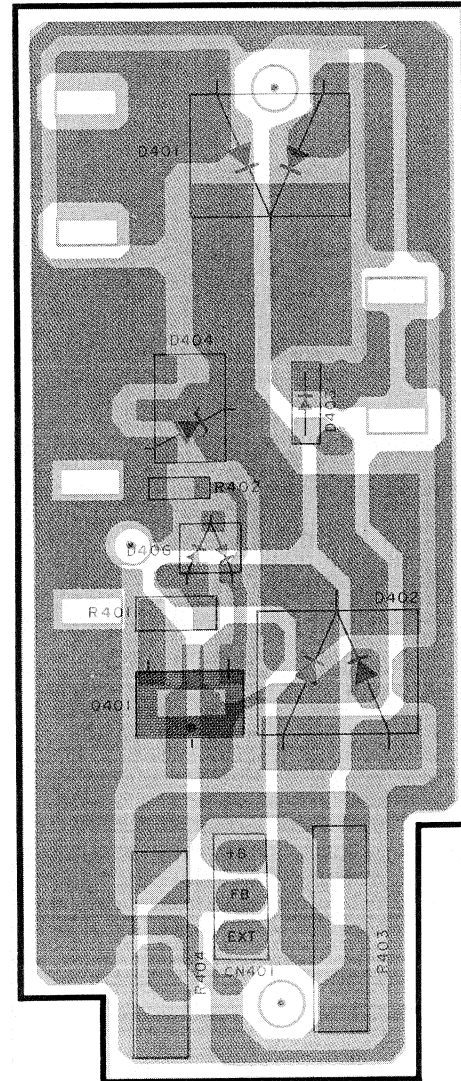


CHARGER (X57-364X-XX) (D/4) Component side view
0-11:K,P 0-21:M 0-22:M2 0-71:X 2-71:T,E 2-72:E2

Q401 : 2SB798(DL,DK)
D401,402 : DE5SC4M or EA400C5F D403 : MA110 D404 : RD22P D406 : 1SS302

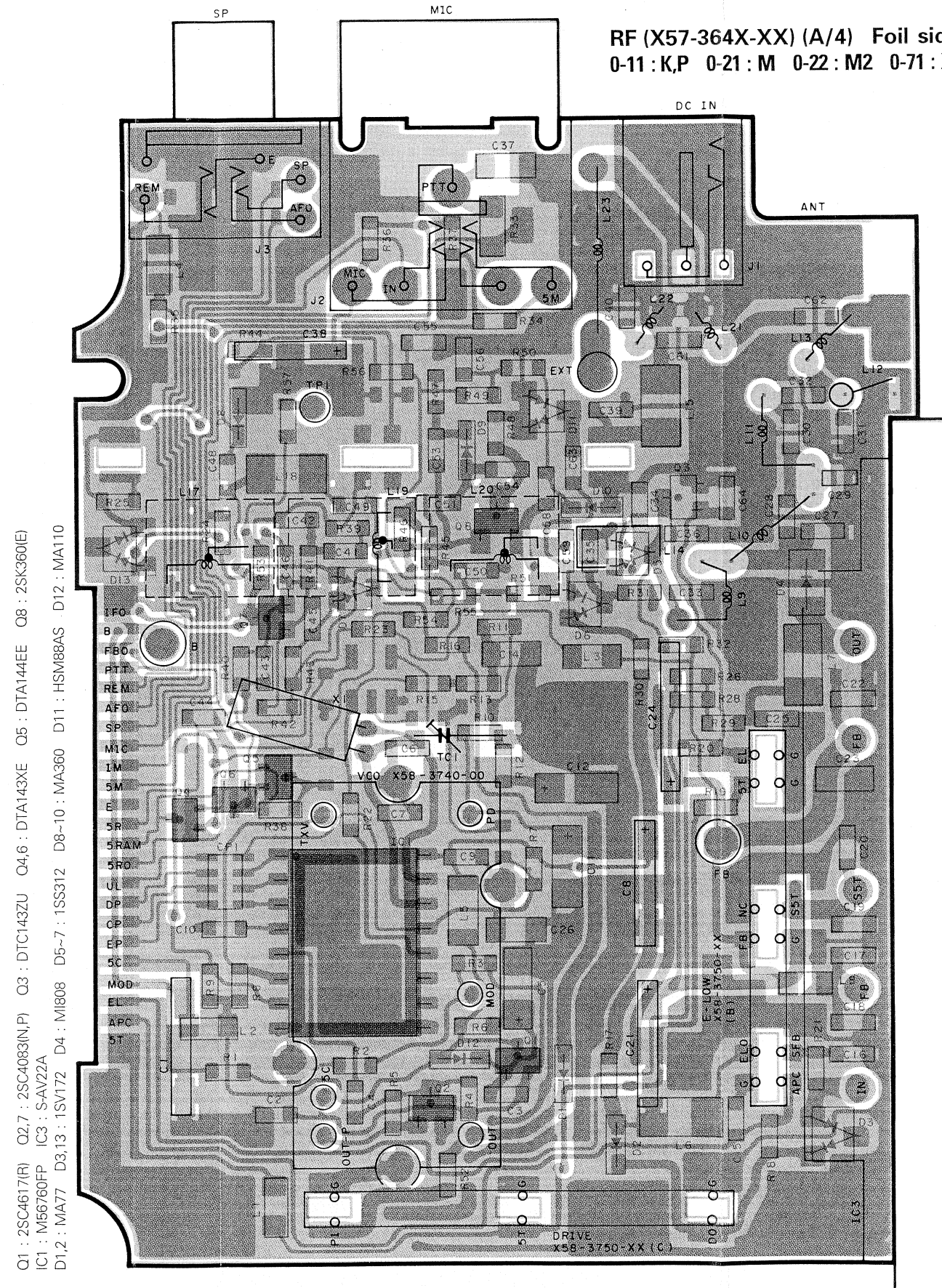


CHARGER (X57-364X-XX) (D/4) Foil side view
0-11:K,P 0-21: M 0-22: M2 0-71: X 2-71: T,E 2-72: E2



Q401 : 2SB798(DL,DK)
D401,402 : DE5SC4M or EA40QC5F
D403 : MA110
D404 : RD22P
D406 : 1SS302

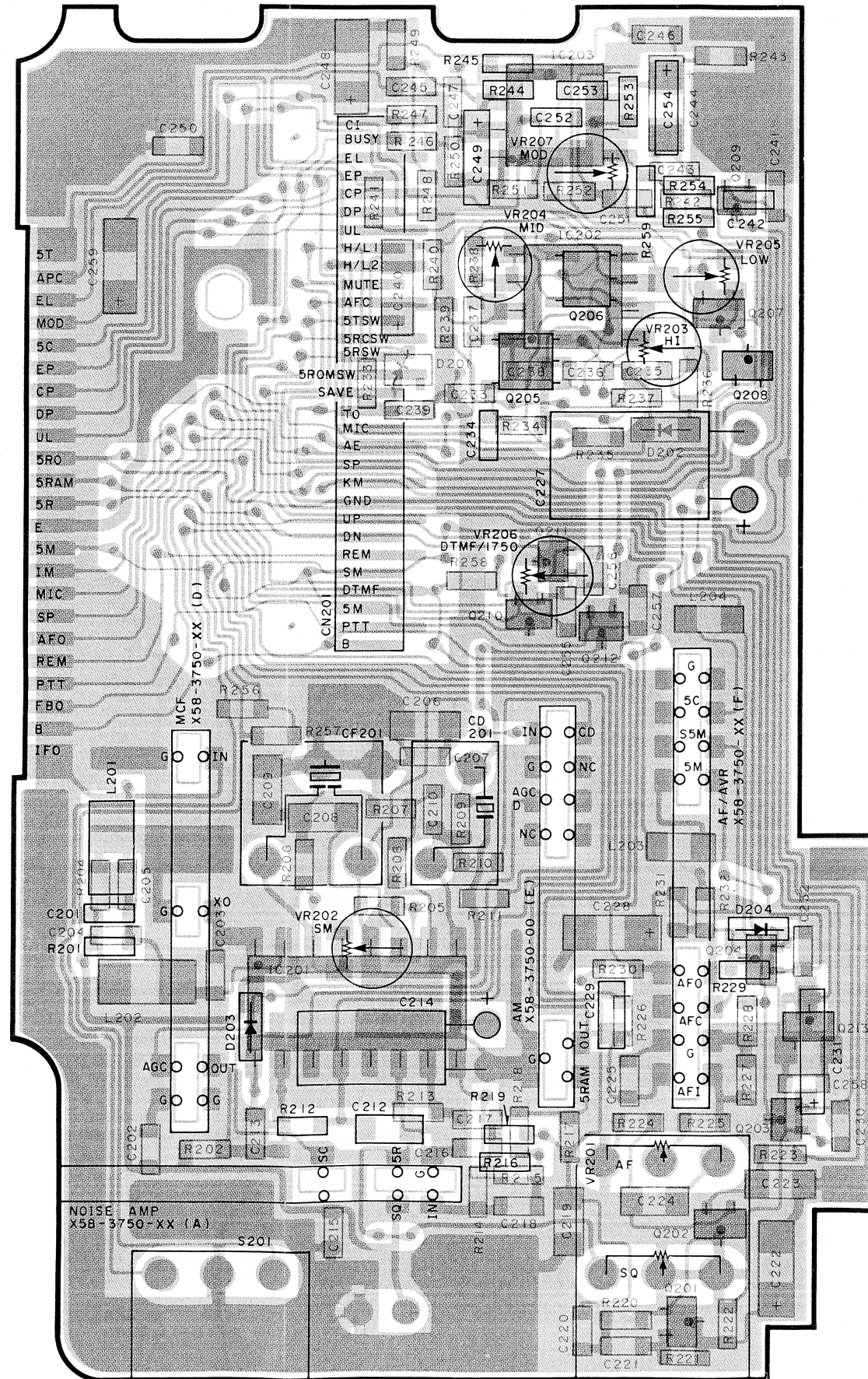
RF (X57-364X-XX) (A/4) Foil side view
0-11: K,P 0-21: M 0-22: M2 0-71: X 2-71: T,E 2-72: E2



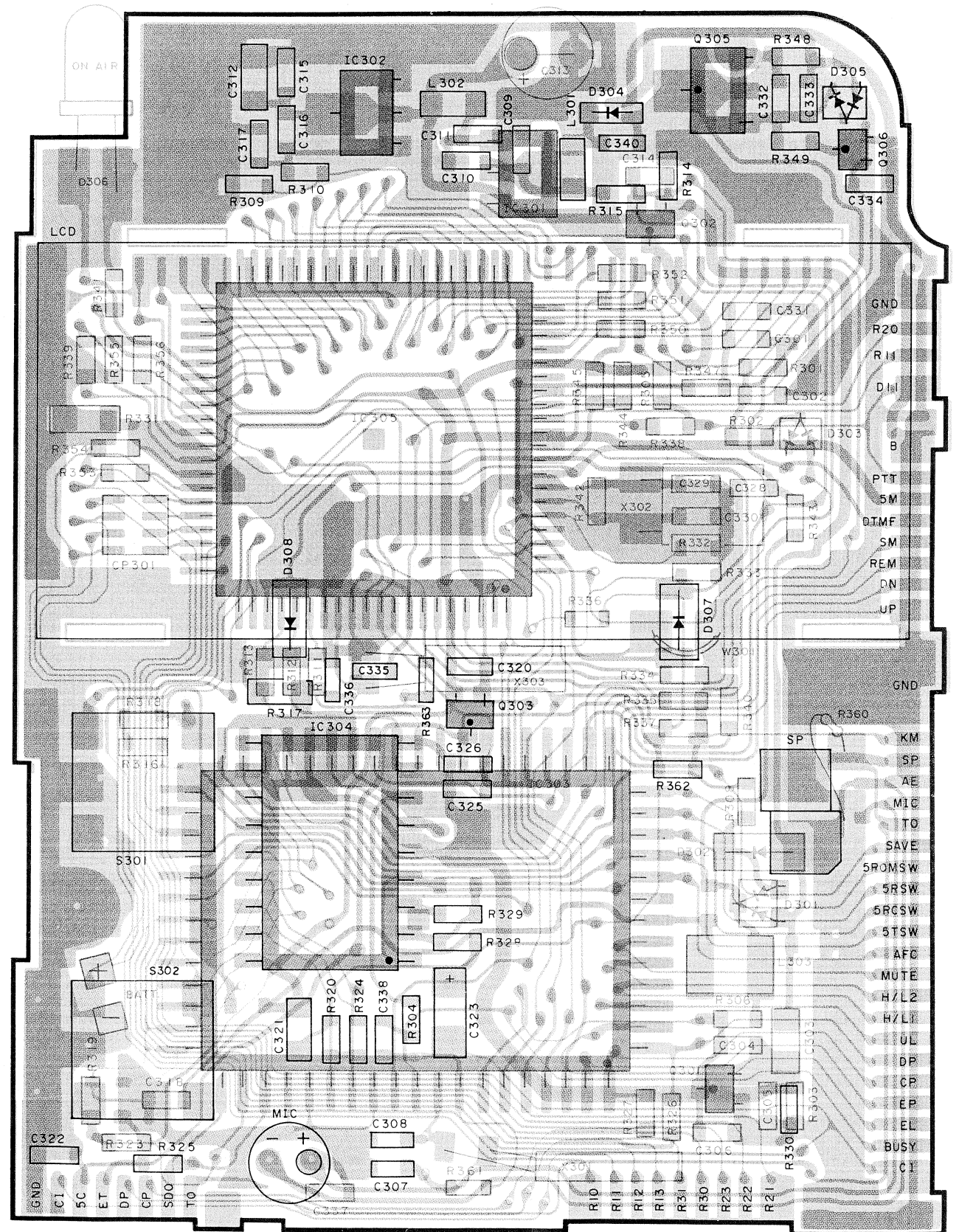
Q1 : 2SC4617(R) Q2,7 : 2SC4083(N,P) Q3 : DTC143ZU Q4,6 : DTA143XE Q5 : DTA144EE Q8 : 2SK360(E)
IC1 : M56760FP IC3 : S-AV22A
D1,2 : MA77 D3,13 : 1SV172 D4 : M1808 D5-7 : 1SS312 D8-10 : MA360 D11 : HSM88AS D12 : MA110

TH-27A/E PC BOARD VIEWS

IF (X57-364X-XX) (B/4) Component side view
0-11:K,P 0-21:M 0-22:M2 0-71:X 2-71:T,E 2-72:E2



CONTROL (X57-364X-XX) (C/4) Component side view
0-11:K,P 0-21:M 0-22:M2 0-71:X 2-71:T,E 2-72:E2

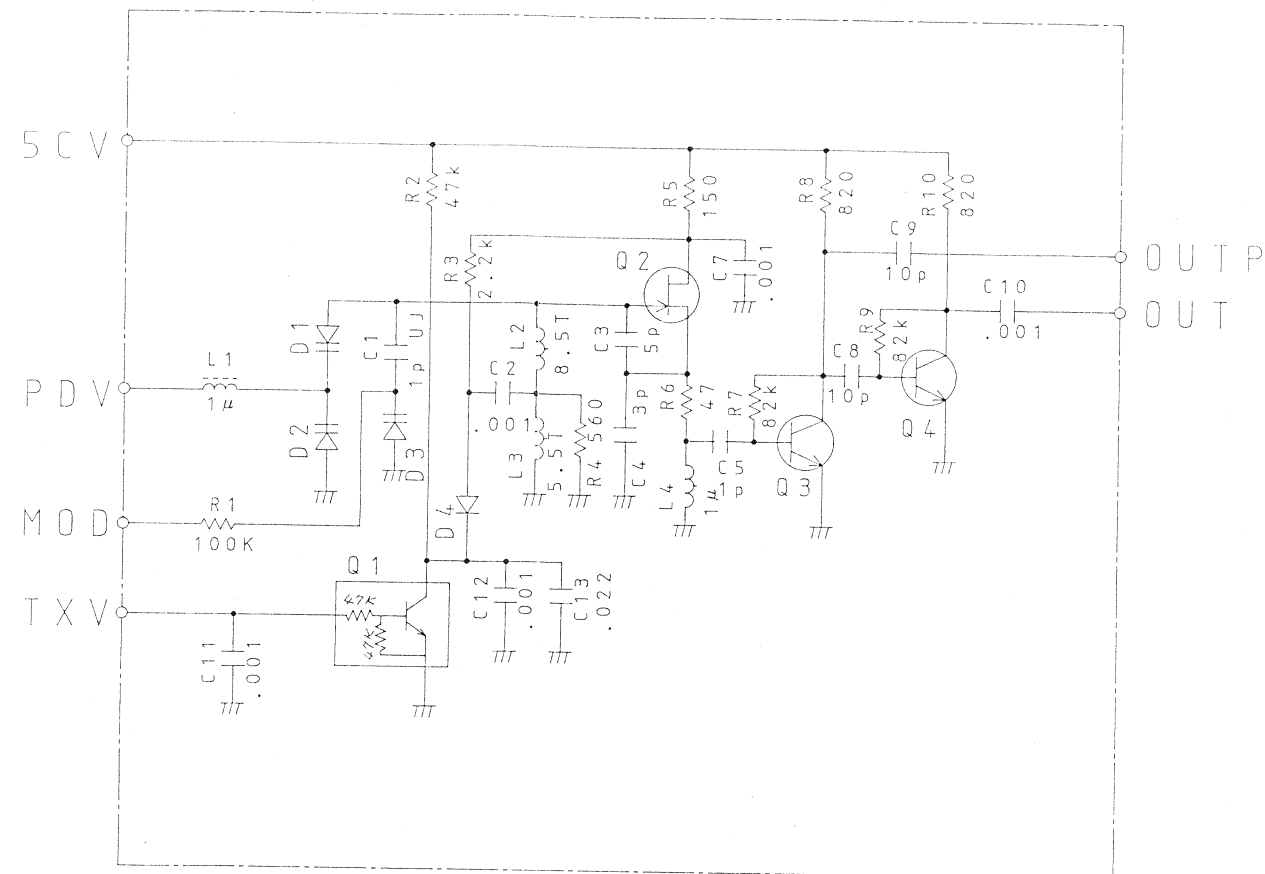


Q201 : 2SC4617(R) Q202 : DTC124EE Q203,204 : DTA144EE Q205,206 : FMC3 Q207 : 2SK879(Y) Q208,209 : DTC114YE
Q210~212 : DTA114YE Q213 : DTB113ZK
IC201 : MC3372D IC202 : LM301AD IC203 : NJM4560M
D201 : DAN222 D202 : MA8039 D203 : MA728 D204 : MA110

Q301 : 2SC4116(Y) Q302 : DTA143XU Q303 : DTA114YU Q305 : 2SB798(DL/DK) Q306 : DTC144EE
IC301 : SG7710YBA*J IC302 : S-8054ALR-LN IC303 : 75112GF-583-3BE or 75112GF-596-3BE IC304 : LC7385M
IC305 : HD40408A80H
D301 : DAN202U D302,307,308 : B30-0897-05 D303,305 : DA221 D304 : MA728 D306 : B30-0880-05

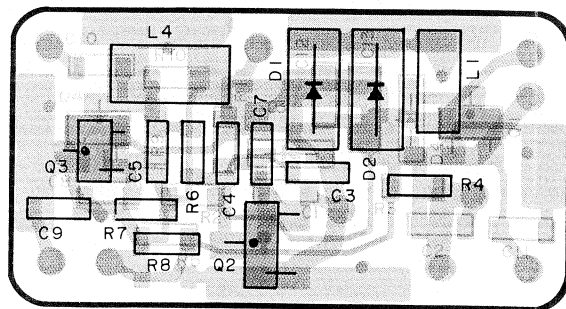
TH-27A/E PC BOARD VIEWS / CIRCUIT DIAGRAMS

A1 : VCO (X58-3740-00)

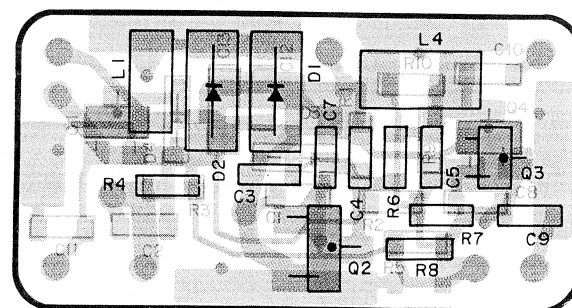


Q1	DTC144EU	D1	MA333
Q2	2SK238 (K17)	D2	MA333
Q3	2SC4083 (N, P)	D3	MA360
Q4	2SC4083 (N, P)	D4	MA77

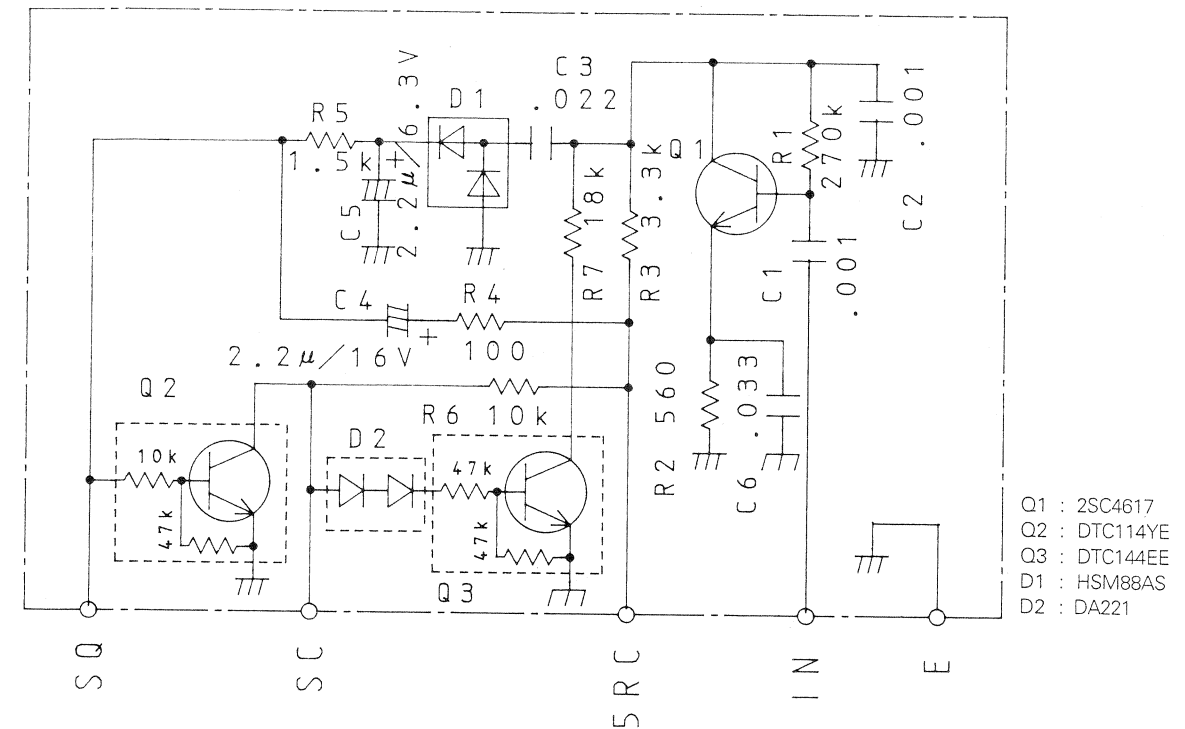
A1 : VCO (X58-3740-00)
Component side view



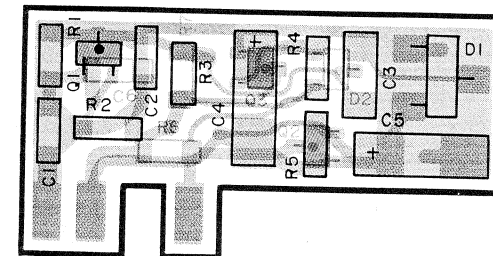
A1 : VCO (X58-3740-00)
Foil side view



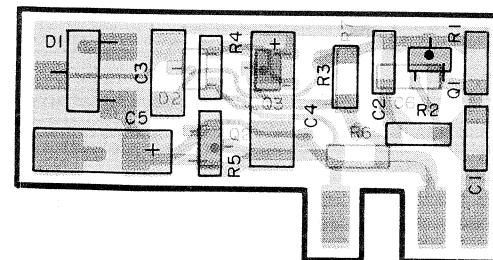
A2 : NOISE (X58-3750-XX) (A) -00 : K,P -11 : M,M2,X,T,E,E2



A2 : NOISE (X58-3750-XX) (A)
Component side view

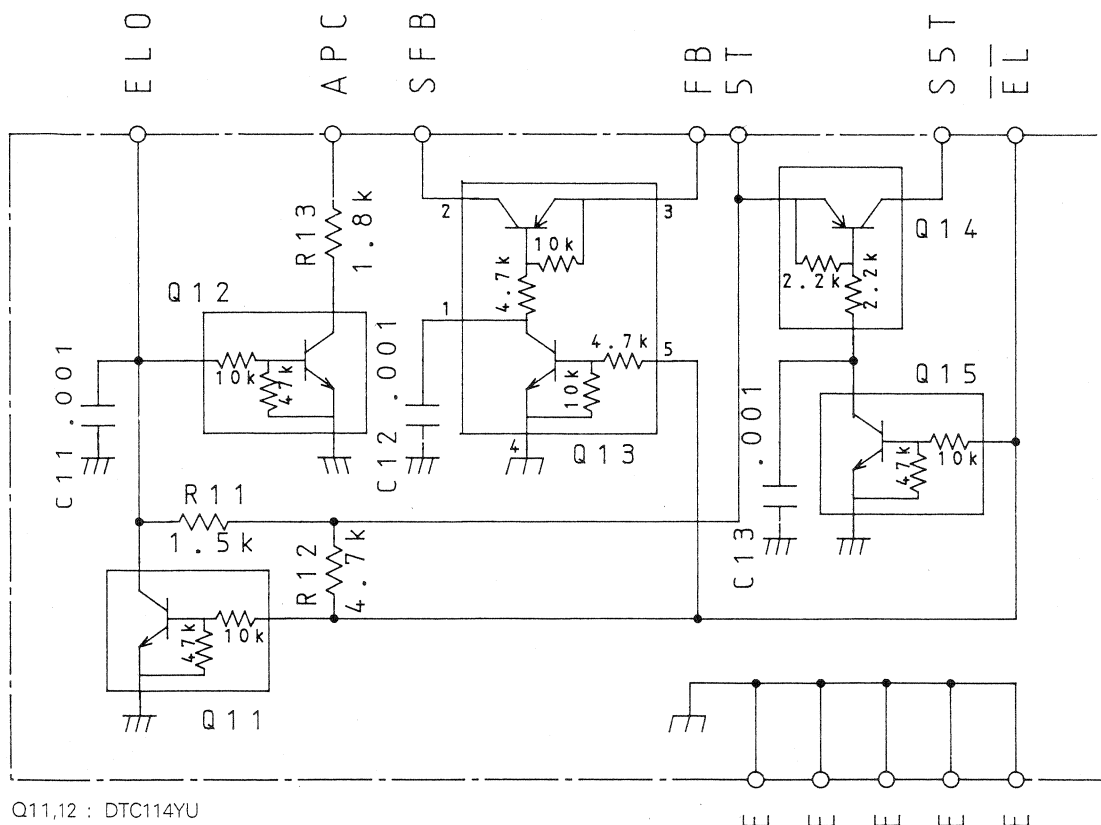


A2 : NOISE (X58-3750-XX) (A)
Foil side view



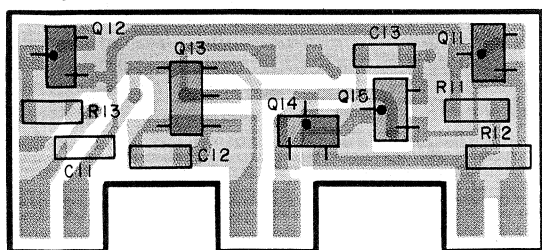
PC BOARD VIEWS / CIRCUIT DIAGRAMS TH-27A/E

A2 : E-LOW (X58-3750-XX) (B) -00 : K,P -11 : M,M2,X,T,E,E2

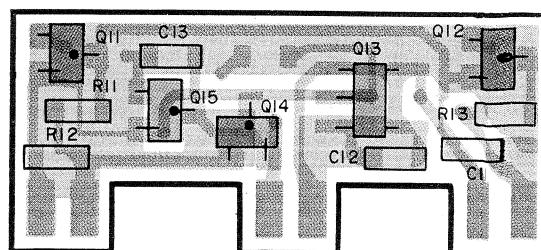


Q11,12 : DTC114YU
Q13 : FMC5
Q14 : DTA123EU
Q15 : DTC114YU

A2 : E-LOW (X58-3750-XX) (B)
Component side view

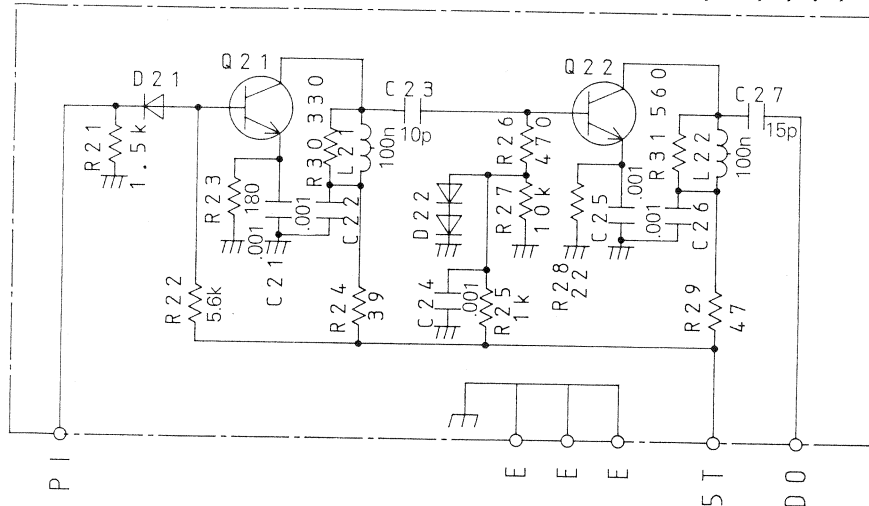


A2 : E-LOW (X58-3750-XX) (B)
Foil side view



TH-27A/E PC BOARD VIEWS / CIRCUIT DIAGRAMS

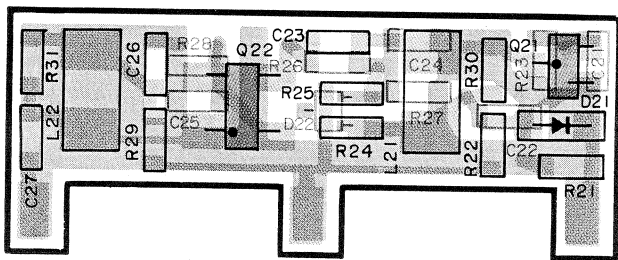
A2 : DRIVE (X58-3750-XX) (C) -00 : K,P -11 : M,M2,X,T,E,E2



Q21 : 2SC4083(N,P)
Q22 : 2SC4093
D21 : MA77
D22 : DA221

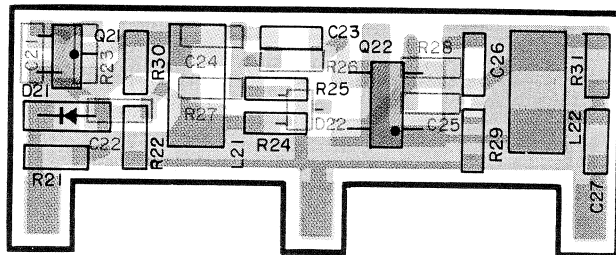
A2 : DRIVE (X58-3750-XX) (C)

Component side view



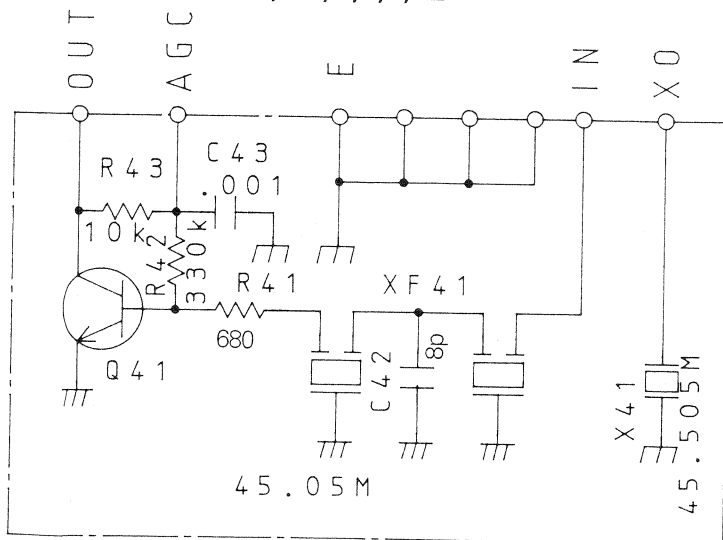
A2 : DRIVE (X58-3750-XX) (C)

Foil side view



A2 : MCF (X58-3750-XX) (D)

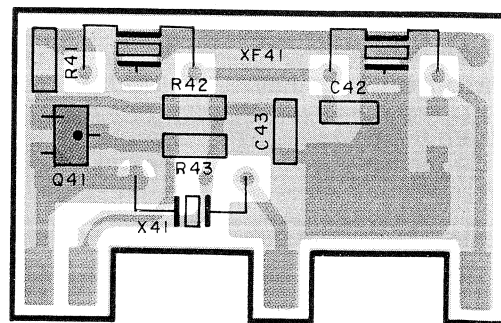
-00 : K,P -11 : M,M2,X,T,E,E2



Q41 : 2SC4215(Y)

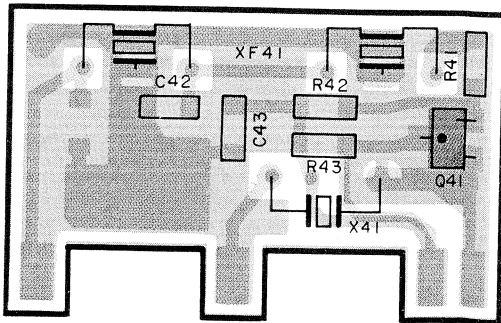
A2 : MCF (X58-3750-XX) (D)

Component side view



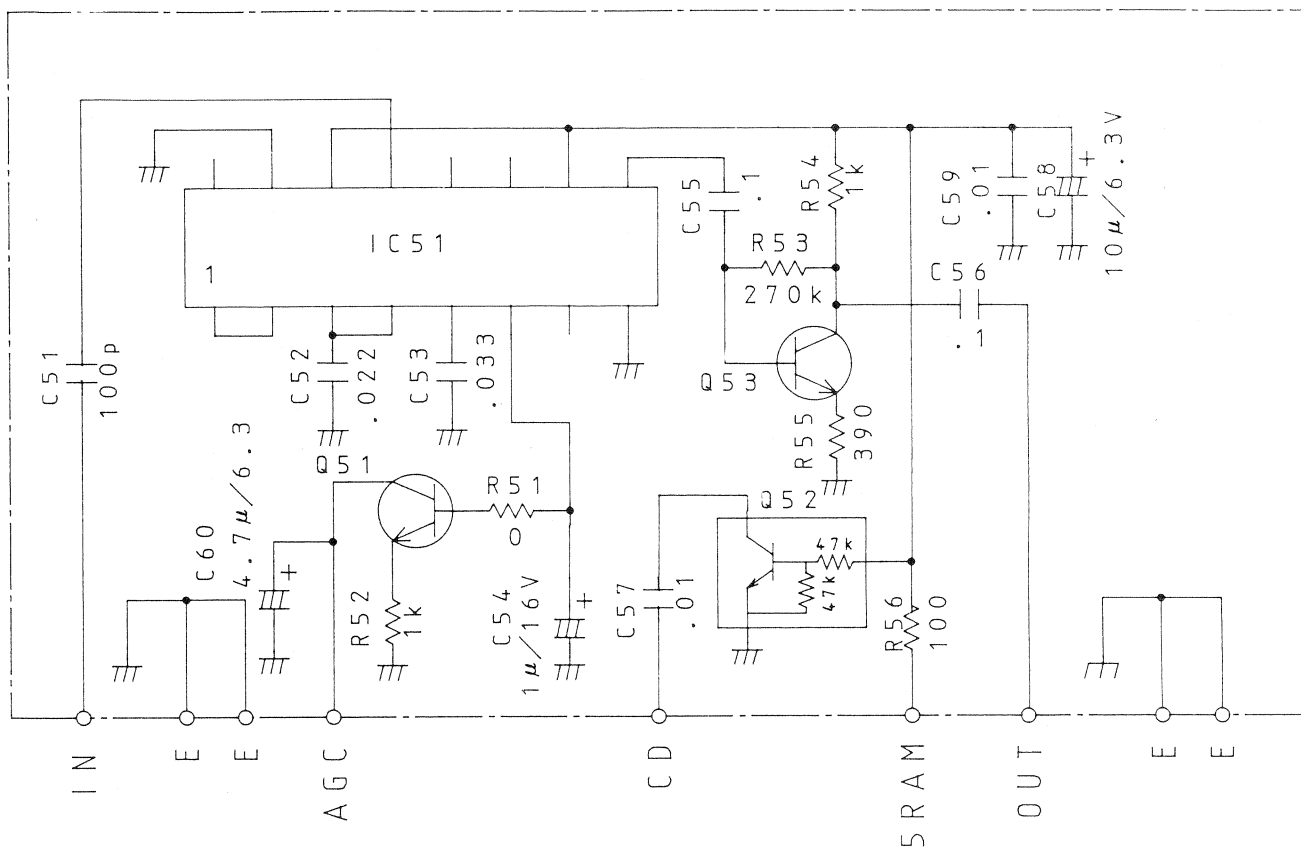
A2 : MCF (X58-3750-XX) (D)

Foil side view



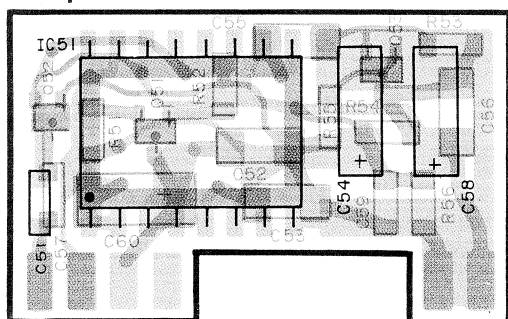
PC BOARD VIEWS / CIRCUIT DIAGRAMS TH-27A/E

A2 : AM (X58-3750-00) (E) : K,P

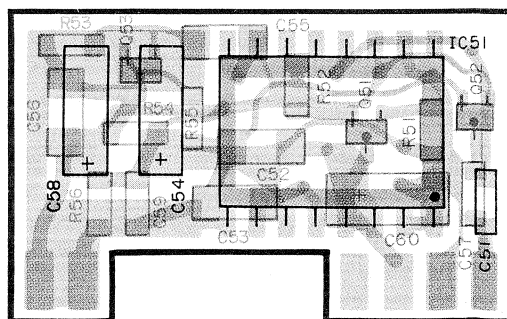


Q51 : 2SC4617
Q52 : DTC144EE
Q53 : 2SC4617
IC51 : TA7787AF

A2 : AM (X58-3750-00) (E)
Component side view

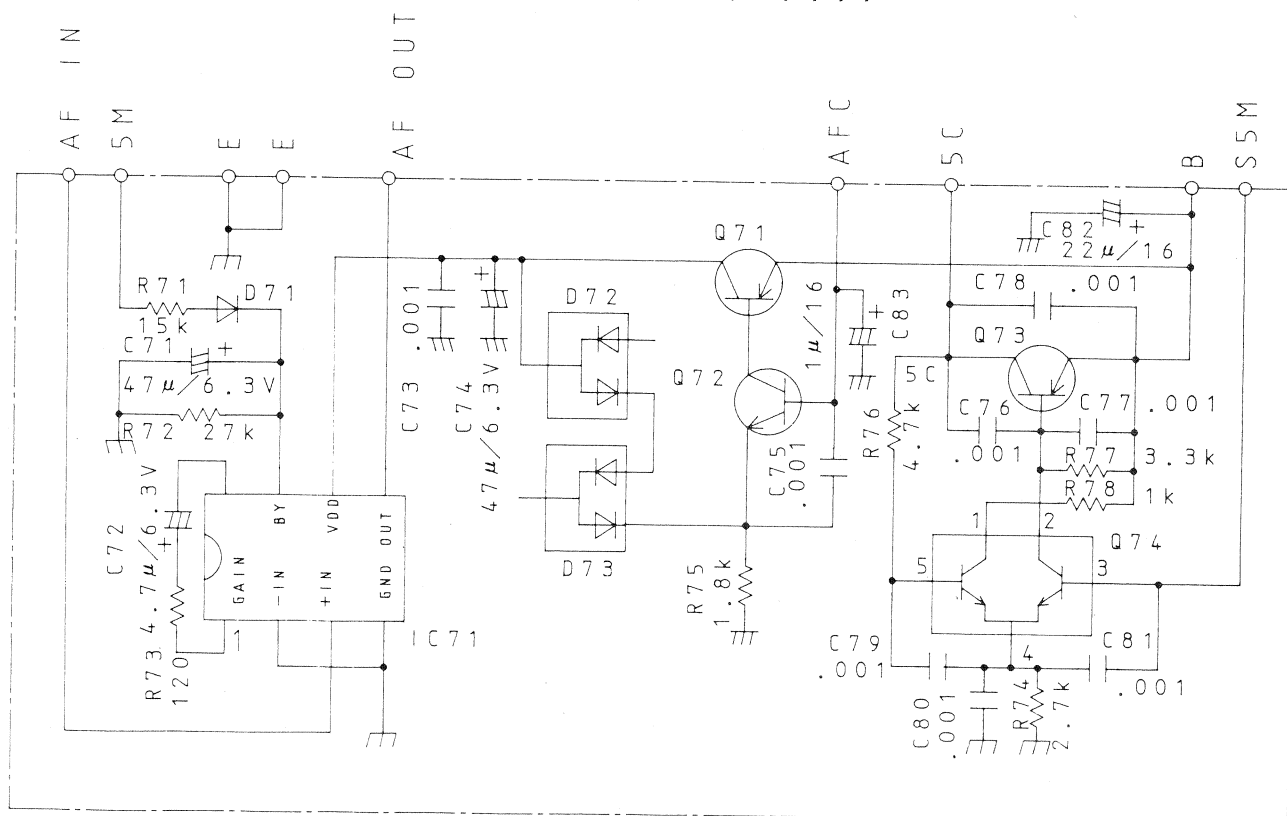


A2 : AM (X58-3750-00) (E)
Foil side view



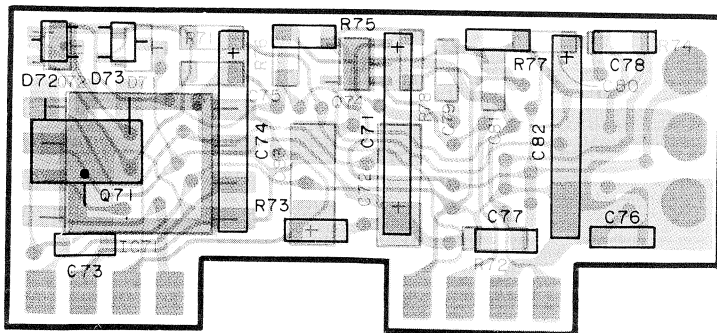
TH-27A/E PC BOARD VIEWS/CIRCUIT DIAGRAMS

A2 : AF/AVR (X58-3750-XX) (F) -00 : K,P -11 : M,M2,X,T,E,E2



A2 : AF/AVR (X58-3750-XX) (F)

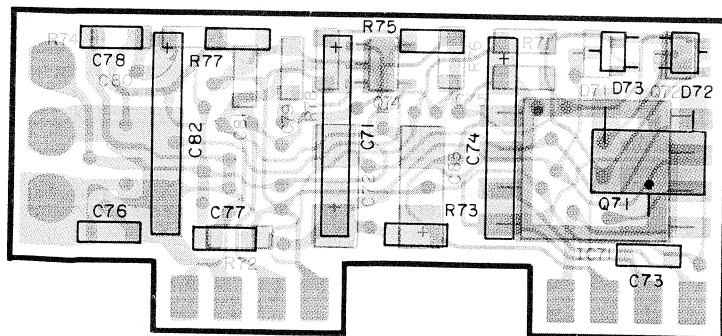
Component side view



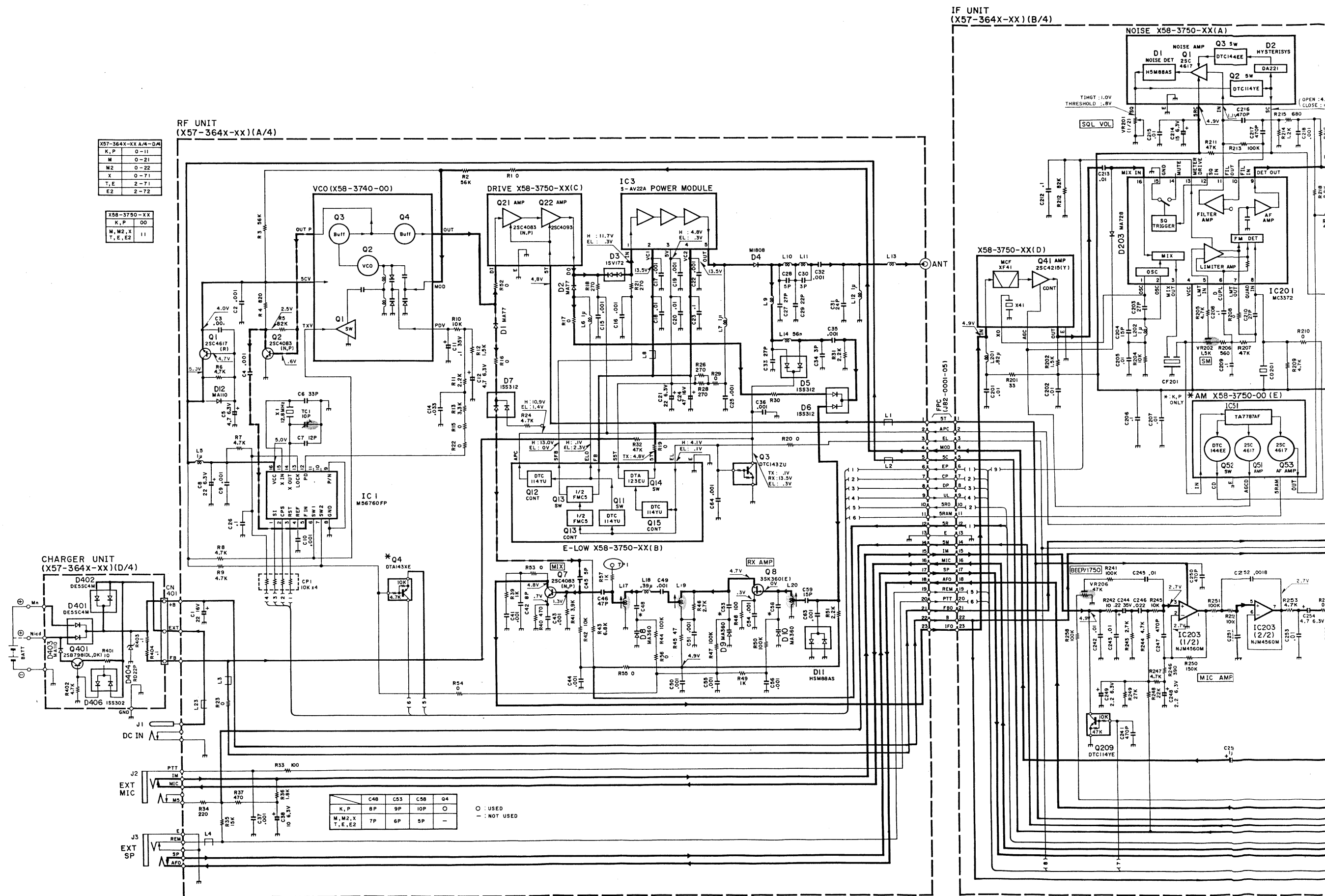
Q71 : 2SB798(DL,DK)
Q72 : 2SC4617
Q73 : 2SB1182
Q74 : UMW1
D71 : DAN222
D72,73 : DA221
IC71 : NJM386BM

A2 : AF/AVR (X58-3750-XX) (F)

Foil side view



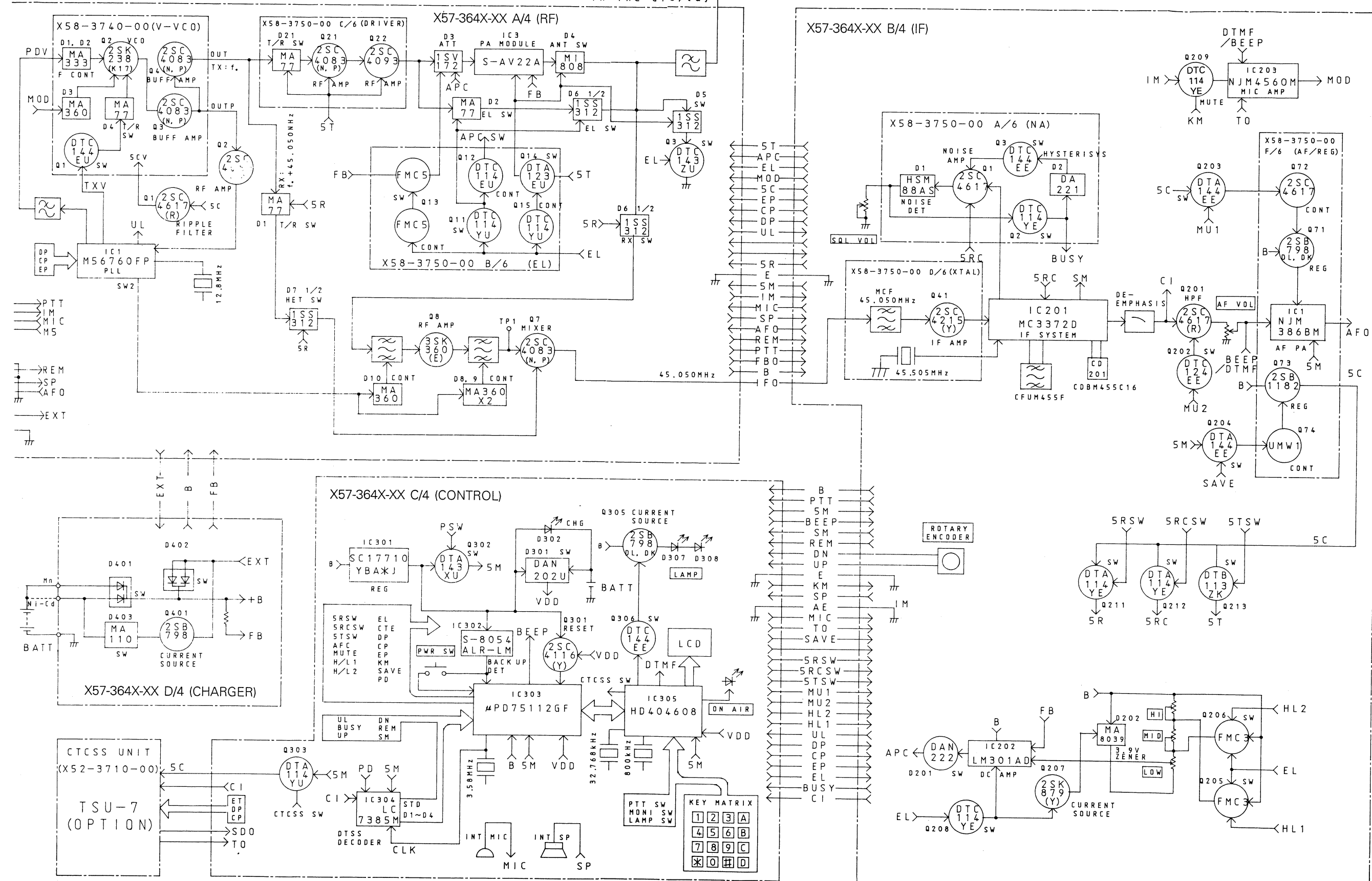
————— Signal line - - - - - Control line ————— Common DC line





TH-27A/E TH-27A/E

f. = the frequency
in the display



Terminal
(E23-0661-04)

Terminal
(E23-0663-04)

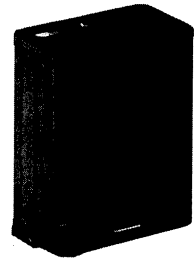
Cushion
(G13-0982-04) x 6

Terminal
(E23-0660-0

BT-8 (BATTERY CASE)

MEMO

BT-8 External View



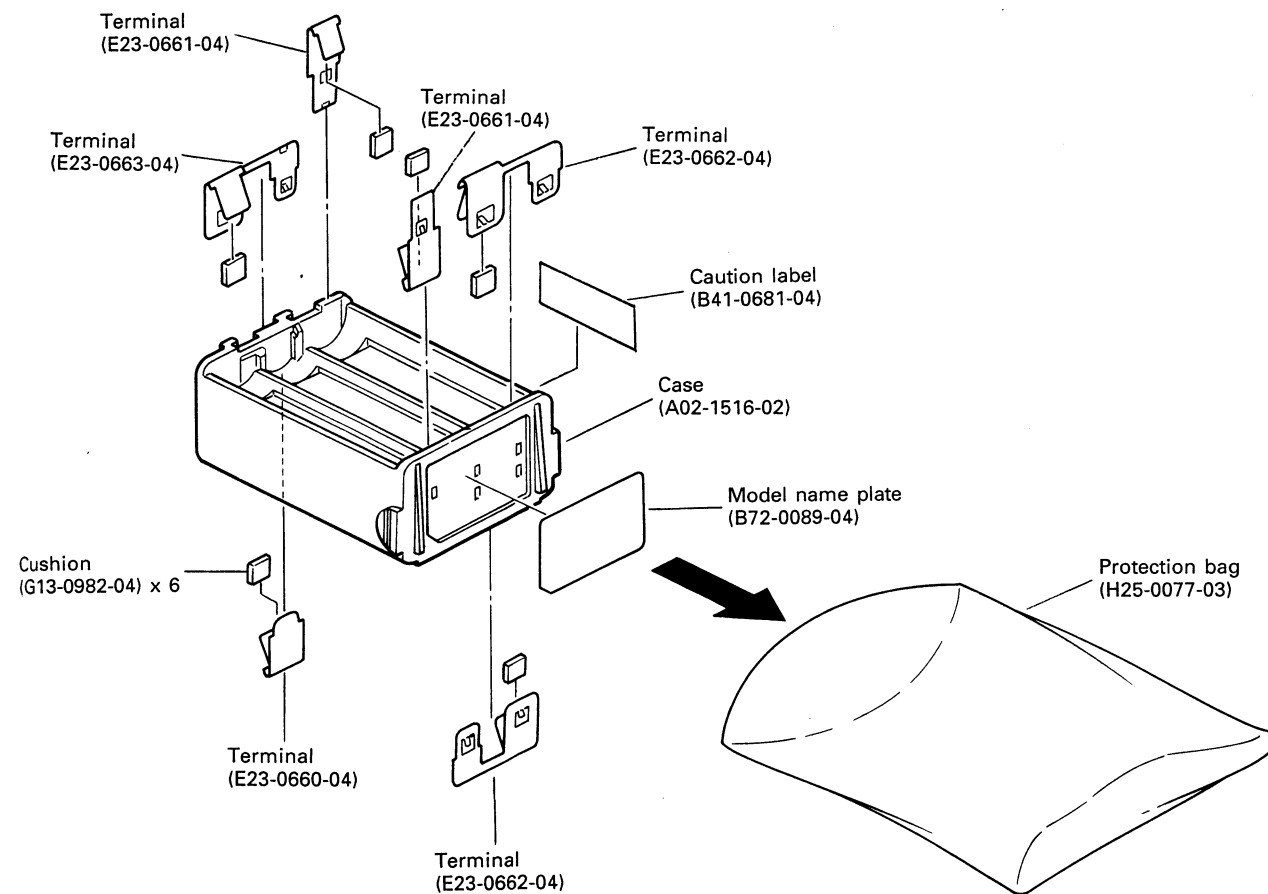
BT-8 Specifications

Dimensions 45.5 W x 56.23 H x 29.8 D (mm)
Weight 210g (Case only)

BT-8 Parts List

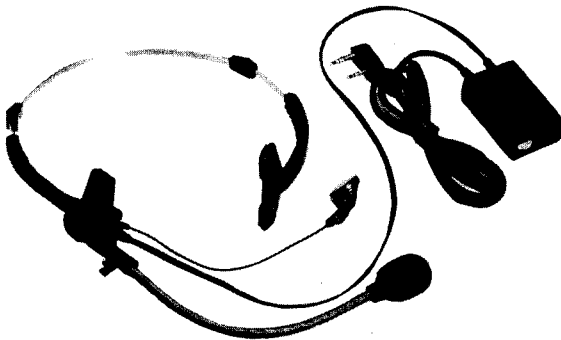
Ref. No.	New	Parts No.	Description
	*	A02-1516-02	Case
	*	B41-0681-04	Caution label
	*	B72-0089-04	Model name plate
		E23-0660-04	Terminal
		E23-0661-04	Terminal
		E23-0662-04	Terminal
		E23-0663-04	Terminal
		G13-0982-04	Cushion
		H25-0077-03	Protection bag

BT-8 Exploded View



HMC-2 (HEAD SET WITH VOX&PTT)

HMC-2 External View



HMC-2 Specifications

Electrical characteristics

• Earphone

Diameter $\phi 19$ (mm)
 Impedance 19Ω (1000Hz)
 Max. input power 50mW

• Microphone

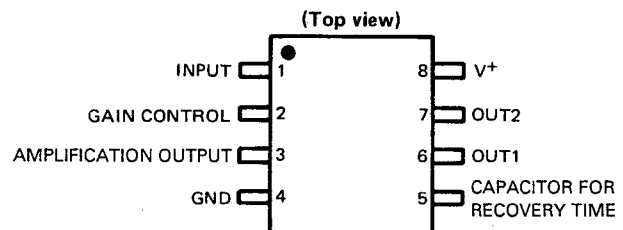
Output sensitivity -67.5dB ($0\text{dB}=1\text{V}/\mu\text{bar}$ 1000Hz)
 Output impedance $1.6\text{k}\Omega$ (1000Hz)

HMC-2 Parts List

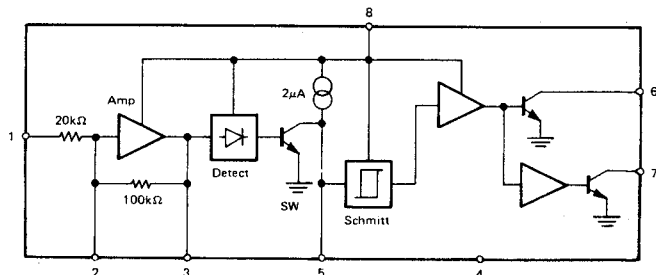
Ref. No.	New	Parts No.	Description
		A02-0840-08	Case (Front)
		A02-0841-08	Case (Rear)
		E30-2088-08	Cable with plug
		E30-3002-08	Junction wire
		F09-0418-08	Microphone pad
		F09-0419-08	Ear pad
		J29-0427-08	Clip
VR1		R05-4422-08	Potentiometer 50k Ω
S1		S31-1416-08	Slide switch PTT/VOX
S2		S50-1413-05	Tact switch PTT
		T18-0056-08	Earphone with cable
		T91-0373-18	MIC ass'y
		W02-0806-18	VOX/PTT unit
Q1		FMG2	Digital transistor
Q2		FMW2	Digital transistor
Q3		2SC2712(GR)	Chip transistor
IC1		NJM2072M	IC
D1		1SS133	Diode

HMC-2 Semiconductor Data

• Terminal connection diagram



• Block diagram

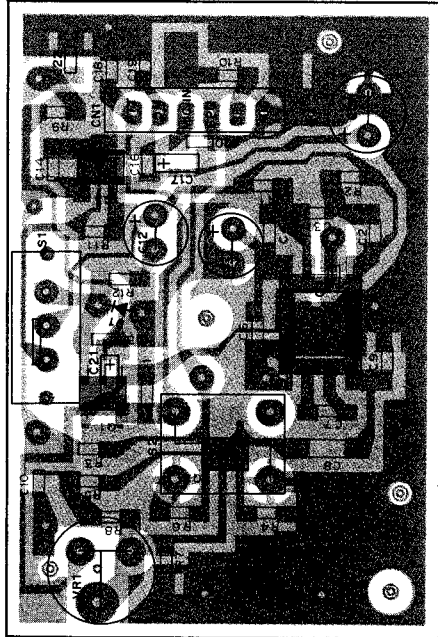


TH-27A/E

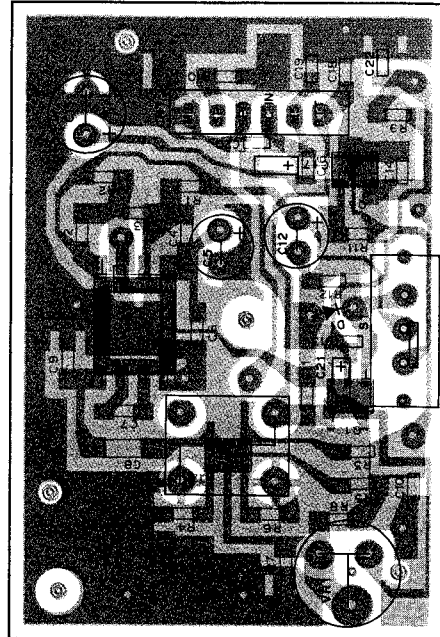
HMC-2 (HEAD SET WITH VOX&PTT)

HMC-2 PC Board Views

Component side view



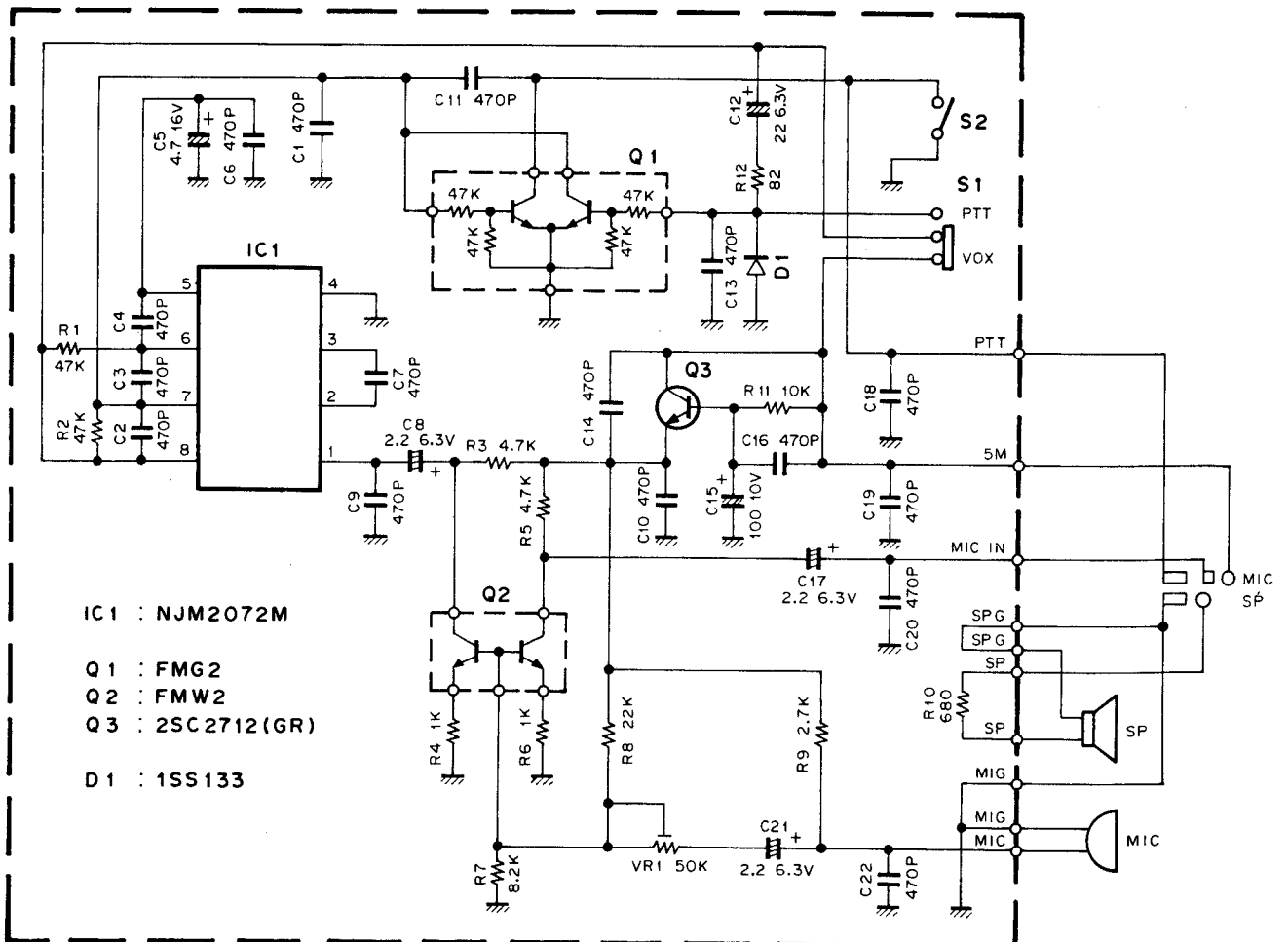
Foil side view



HMC-2 Circuit Diagram

■ : Component side

■ : Foil side



SMC-31/32/33 (SPEAKER MICROPHONE)

SMC-31 External View



SMC-31 Specifications

Electrical characteristics

- **Speaker**
 - Diameter ø45 (mm)
 - Impedance 8Ω
 - Rated input power 0.15W
 - Max. input power 0.3W
- **Microphone**
 - Sensitivity 66dB ± 3dB at 1300Hz
 - Output impedance 2kΩ ± 30% at 1000Hz

SMC-31 Parts List

Ref. No.	New	Parts No.	Description
		D10-0605-08	PTT lever
		E30-2110-05	Curl cord ass'y
		J19-1360-08	Clip
		T07-0219-08	Speaker
		T97-1024-08	Microphone

SMC-32 External View



SMC-32 Specifications

Electrical characteristics

- **Speaker**
 - Diameter ø28 (mm)
 - Impedance 8Ω
 - Rated input power 0.5W
 - Max. input power 1W
- **Microphone**
 - Sensitivity 66dB ± 3dB at 1300Hz
 - Output impedance 2kΩ ± 30% at 1000Hz

SMC-32 Parts List

Ref. No.	New	Parts No.	Description
		E30-3127-08	Curl cord ass'y

SMC-33 External View



SMC-33 Specifications

Electrical characteristics

- **Speaker**
 - Diameter ø28 (mm)
 - Impedance 8Ω
 - Rated input power .. 0.5W
 - Max. input power ... 1W
- **Microphone**
 - Sensitivity 58dB ± 3dB (0dB=1V/μbar) at 1300Hz
 - Output impedance 2kΩ ± 30% at 1000Hz

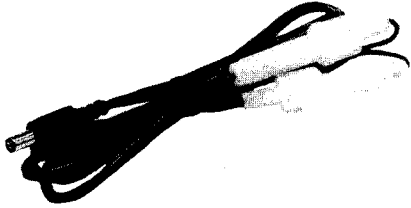
SMC-33 Parts List

Ref. No.	New	Parts No.	Description
		E30-2196-08	Curl cord ass'y
		T91-0392-05	Microphone with speaker

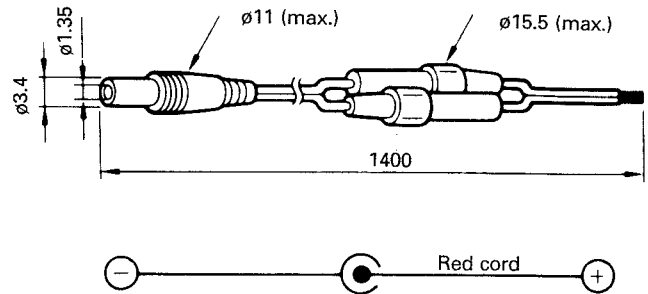
TH-27A/E

PG-2W (DC CORD)/PG-3F (CORD WITH PLUG)

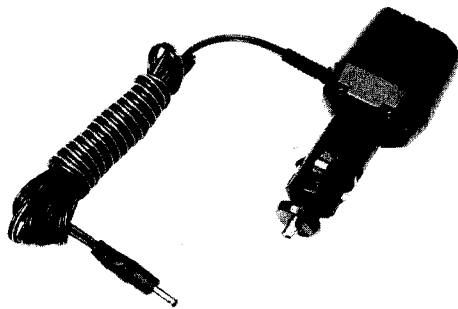
PG-2W External View



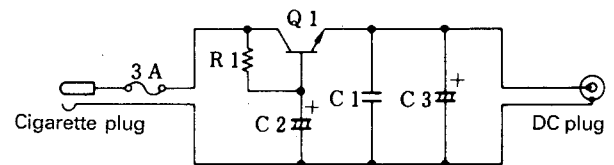
PG-2W Dimensions



PG-3F External View



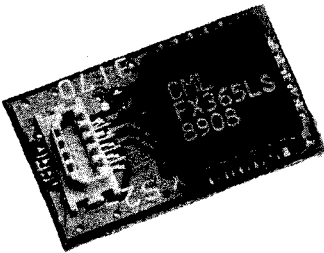
PG-3F Circuit Diagram



Q1 : 2SD717(O.Y)
 R1 : 22 Ω 1/4W
 C1 : 0.001 μ F 50V
 C2 : 2.200 μ F 16V
 C3 : 100 μ F 16V

TSU-7/CTCSS UNIT (X52-3170-00)

TSU-7 External View

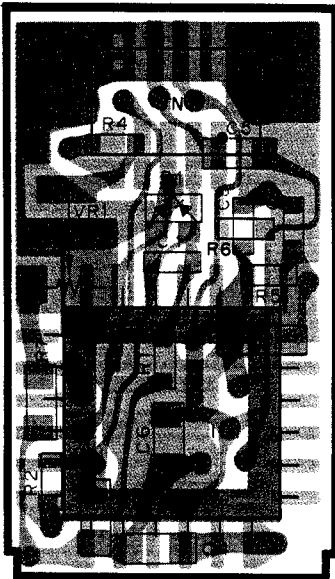


TSU-7 Parts List

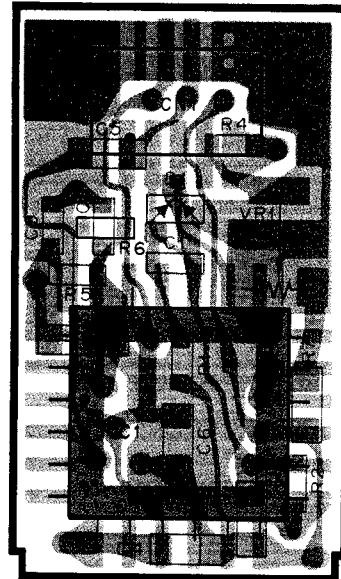
Ref. No.	New	Parts No.	Description
TSU-7 (X52-3170-00)			
C1		CK73GB1H471K	Chip C 470pF K
C2		C92-0521-05	Chip Tan. 0.47μF 20VV
C4~6		CK73FB1E104K	Chip C 0.1μF K
C7		CK73GB1H471K	Chip C 470pF K
C8,9		CC73GCH1H221J	Chip C 220pF J
CN1		E40-5341-05	Connector
		G10-0692-04	Cushion
		H21-0704-04	Cushion
X1	*	L78-0062-05	Crystal 1MHz
R1		RK73BG1J274J	Chip R 270k J
R2		RK73BG1J824J	Chip R 820k J
R4		RK73BF1J103J	Chip R 10k J
R5		RK73BG1J105J	Chip R 1M J
R6		RK73BG1J473J	Chip R 47k J
VR1		R12-6526-05	Trimming pot. 47k
IC1	*	FX365LS	IC
D1		DAN202U	Chip diode

TSU-7 PC Board Views

Component side view



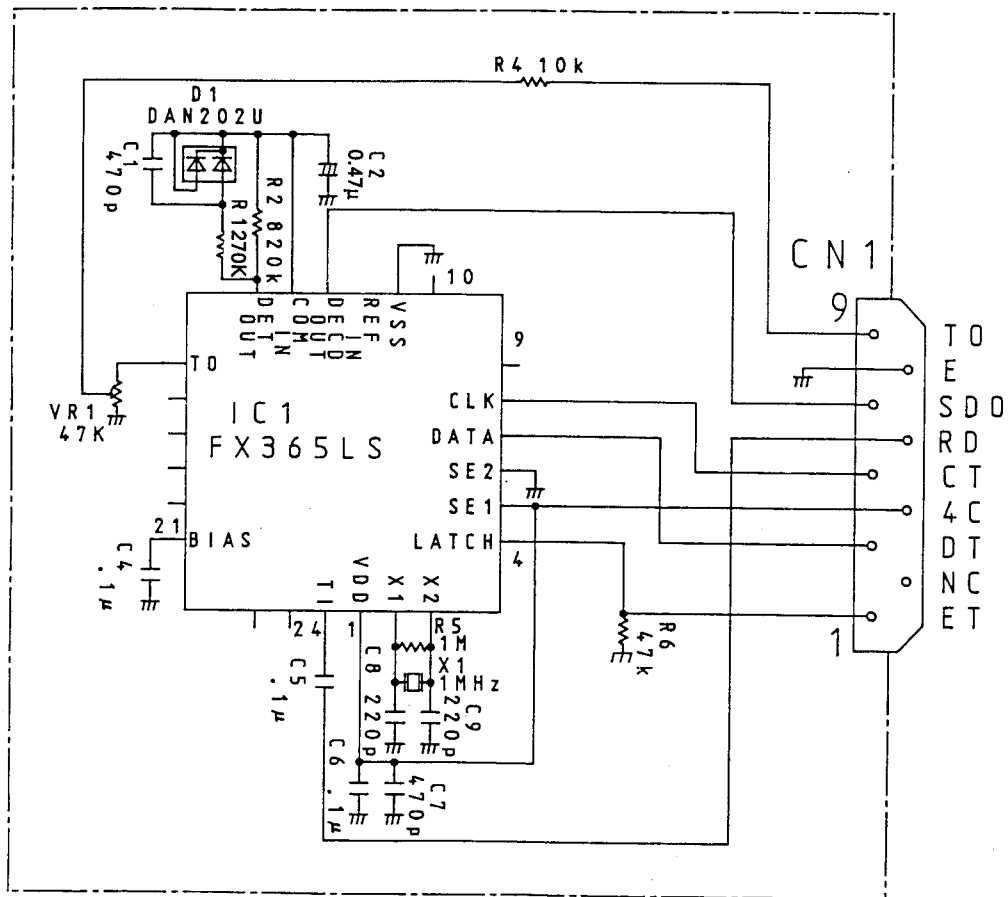
Foil side view



TH-27A/E

TSU-7/CTCSS UNIT (X52-3170-00)

TSU-7 Circuit Diagram



TH-27A/E

BH-6 (SWIVEL MOUNT)/HB-2 (HAND STRAP)
HS-9 (EARPHONE)/MB-6 (MOBILE BRACKET)
SC-30 (SOFT CASE)/WR-2 (WATERPROOF CASE)

BH-6 External View



HB-2 External View



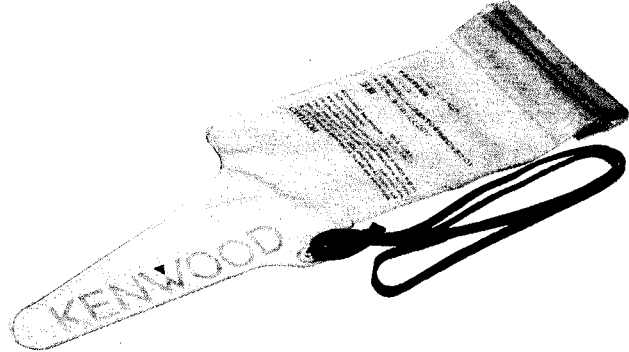
HS-9 External View



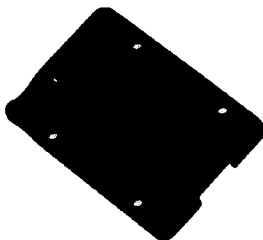
SC-30 External View



WR-2 External View



MB-6 External View



MB-6 Parts List

Ref. No.	New	Parts No.	Description
		N99-0320-05	Screw set

TH-27A/E

SPECIFICATIONS

GENERAL

Frequency range	
U.S.A. version	144 to 148MHz
U.K. and Europe	144 to 146MHz
Other market	144 to 148MHz
Mode	F3E (FM)
Antenna impedance	50 Ω
Operating temperature	-20 to +60°C (-4 to +140°F)
Power requirements	
DC IN (nominal)	7.2 to 16V DC (13.8V DC)
Battery pack	6.3 to 16V DC (7.2V DC)
Current drain	
13.8V DC (Ext. power supply) H	Approx. 1.5A
7.2V DC (Battery) H	Approx. 1.0A
Transmit mode L	Approx. 0.5A
Transmit mode EL	Approx. 0.12A
Receive mode with no signal	Approx. 60mA
Battery save mode	Approx. 17mA
Ground	Negative
Dimensions (W x H x D)	
Projections not included	49.5 x 124.7 x 38.0 (mm)
Projections included	57 x 138.7 x 39.7 (mm)
Weight	360g
Microphone impedance	2k Ω

TRANSMITTER

Output power	
H (13.8V DC)	More than 5W
H (7.2V DC)	Approx. 2.5W
L	Approx. 0.5W
EL	Approx. 20mW
Modulation	Reactance
Maximum frequency deviation	± 5 kHz
Spurious radiation	Less than -60dB

RECEIVER

Circuitry	Double conversion superheterodyne
Intermediate frequency	
1st IF	45.05MHz
2nd IF	455kHz
Sensitivity (12dB SINAD)	Less than -16dB μ (0.16 μ V)
Squelch sensitivity	Less than -20dB μ (0.1 μ V)
Selectivity	
-6dB	More than 12kHz
-60dB	Less than 28kHz
Audio output power (10% distortion)	More than 20mW (across 8 Ω load)

Notes

1. Circuits and rating are subject to change without notice due to development in technology.
2. Recommended duty cycle : 1 minute transmission, 3 minutes reception.

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